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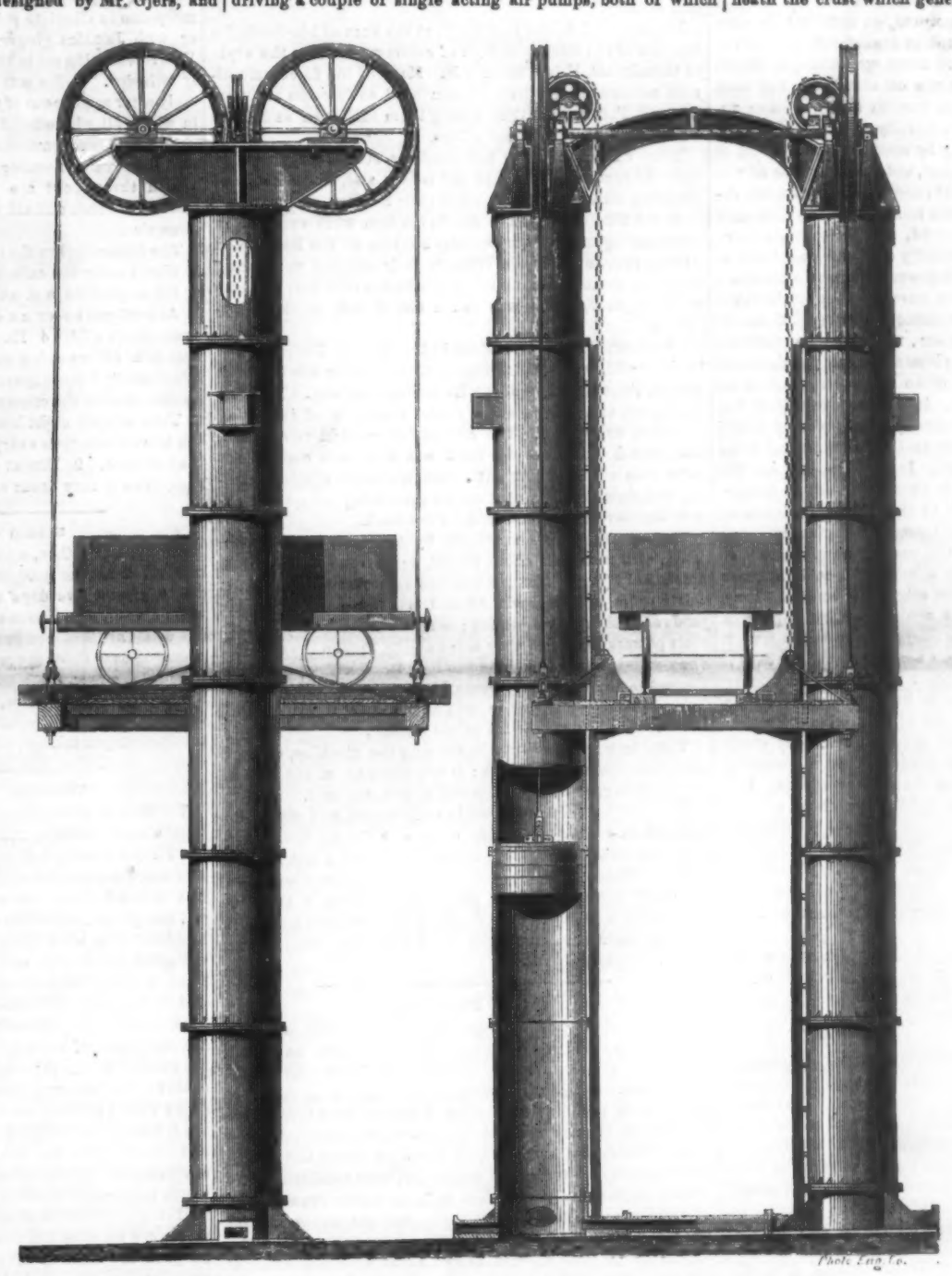
PNEUMATIC ELEVATOR.

At the Ayresome Iron Works, the materials are raised to the level of the top of the range of calcining kilns and store bunkers by a pneumatic hoist, this hoist being situated at one end of the range, while at the other there is a pneumatic drop, by which the empty wagons are lowered. We now give an engraving of the hoist, which will explain its construction.

The lift—which is of a type designed by Mr. Gjers, and successfully introduced by him several years ago—consists of a pair of cast iron cylinders placed sufficiently far apart for the platform on which the wagons are carried to rise and fall between them. Each cylinder is 48 inches in diameter, and is made in lengths of 8 feet each, bolted together by flanges, as shown, each length being recessed at one end to receive a corresponding rib formed on the face of the next length. The two cylinders are 14 feet 9 inches apart from center to center, and at the top they are connected by a cast iron arched girder which ties them firmly together. Each cylinder also carries at the top a pair of short cast iron girders or caps, which serve to support the plummer blocks for the axes of the pulleys around which pass the ropes connecting the platform with the pistons of the pneumatic cylinders. These pulleys are each 8 feet in diameter by 9 inches broad on the face, and they are made with wrought iron arms and cast iron rims and bosses. The two corresponding pulleys belonging to the two cylinders are keyed on the same shaft, this shaft being about 5 inches in diameter; and as the wire ropes from the corners of the table are made to lap once round the pulleys, the pistons in the two cylinders are compelled to move together, and the table is kept horizontal while rising and falling. The shafts of the two pairs of pulleys are situated 9 feet apart from center to center, and there is thus sufficient room between each pair of pulleys for a safety chain which is attached to the piston, carried over a pulley 2 feet 9 inches diameter, as shown in the front elevation, and thence down to the table. Under ordinary circumstances, however, these safety chains are free from strain, and they are merely provided to act in the event of the breakage of a rope.



PNEUMATIC ELEVATOR AT THE AYRESOME IRON WORKS.

The platform consists of transverse timber beams, 15 feet 4 inches long, 14 inches deep by 12 inches thick, to the ends of which the wire ropes, already mentioned, are attached, these beams being connected by suitable timber framing and by the longitudinal beams on which the rails are fixed. The length of rails carried by the platform is 20 feet. To the framing of the platform are bolted a pair of cast iron brackets, which work against timber guides fixed to the cylinders, as shown. These brackets also form the points of attachment for the safety chains, and from the tops of them truss rods pass diagonally to the ends of the transverse timber beams already mentioned, as shown in the engraving.

The pistons are of cast iron, and are packed with double cupped leathers, ready access to the packing being obtained through openings formed in the sides of the upper lengths of the pneumatic cylinders, these lengths not being traversed by the pistons during the regular working of the hoist. The lift is worked by alternately creating in the cylinders a plenum, or a partial vacuum below the pistons, according to whether the table has to be lowered or raised. In ordinary working, the loads to be taken up vary from 15 to 16 tuns, and the balance is such that with this load an exhaustion equal to about 6 lbs. per square inch is required to lift the table, while a plenum of about 4 lbs. per square inch is required to bring the table down.

The hoist is worked by a pair of engines having the cylinders inclined at an angle of 45°, the two connecting rods being coupled to a single crank at the center of a crank shaft which has at its ends a pair of opposite overhung cranks driving a couple of single acting air pumps, both of which exhaust from one pipe and deliver into another. These two pipes are connected to a casing fitted with a slide valve, the arrangement being such that, by merely shifting this valve, either the suction pipe can be placed in communication with the cylinders of the hoist, and the delivery pipe with the external air, or *vice versâ*. The two cylinders of the hoist are placed in communication with each other by a pipe of rectangular section connecting their lower ends, this pipe measuring 6 inches by 12 inches inside, while from one of the cylinders a pipe leads off to the slide valve casing already mentioned.

The hoist we have been describing lifts the wagons 35 feet, and with the four furnaces in full work, it will have to raise at least 6,000 tuns per week, this quantity being the gross weight of the material and trucks. At present, of course, it is raising but about half that quantity. As we have already stated, pneumatic hoists, such as that we illustrate, were introduced several years ago by Mr. Gjers, and they are now in use at a number of iron works. They work very steadily, are controlled with great ease, and require a very moderate expenditure for maintenance, while their construction is such that working parts are at all times open to inspection—an important point in machinery of this class.—*Engineering*.

Is Electricity Generated by Water Currents?

Zöllner has ascribed the production of the electric currents of the earth to the incandescent molten masses in motion beneath the crust which generate currents in the direction of their own motion; and he has expressed the opinion that all current movements of fluids, especially when in contact with solid bodies, are to some extent accompanied with currents of electricity that have the same direction as the fluids themselves. He inserted the ends of the copper wires of a very delicate galvanometer, of Sauerwald, just within the wall of a caoutchouc tube conveying a stream of water, and obeerved a deflection of several degrees of the galvanometer scale, thereby indicating the existence of an electrical current whose direction is that of the water. The greater the distance between the ends of the wires—which, by the way, need not be exposed to the force of the current, but may be replaced by metallic plates lying against the wall of the tube—the stronger the deflection of the needle.

While recently repeating Zöllner's experiments, Beetz obtained similar results, but found that the currents have a much simpler origin. The needle is deflected so long as the reservoir in which the water falls is not isolated. The metal tap, the stream of water, and the reservoir, in fact, form a voltaic element (brass, water, lead) whose current it is which deflects the needle. By filling the reservoir, and dipping the free end of the tube, also filled, into it, the current is observed though the water be shut off, nor does any change take place when the tap is opened. By simply inverting the position of the tube, the direction of the current is reversed; this is observed to be the case with or without a flow of water. If the reservoir be isolated, no current is formed; this is so whether the water be allowed to flow or not. When tap and reservoir are of zinc, no current is produced with or without a flow of water, and with or without isolation of the reservoir. According to Beetz's observations, then, no electricity is generated by a stream of water.

SOLAR ECLIPSES AND MAGNETIC VARIATIONS.—In reference to the question of a possible connection between solar eclipses and terrestrial magnetic variations, as deduced from the observations of December, 1870, M. Broun states that a comparison of observations made at Trevandrum (near the central line of the eclipse of December, 1871, on that occasion) with other observations indicates that ordinary slight magnetic disturbances, passing from one region to another, do not appear to undergo any change of character either before, during, or after an eclipse. And hence he concludes that solar eclipses have not the influence in producing terrestrial magnetic variations that Diamilla Müller and others had assigned to them.

ONE hundred and twenty-one patents have been granted on windmills in the United States since 1854.

PLATING WITH ALUMINUM.

[From the *Deutsche Industrie Zeitung*, by Dr. Clemens Winkler.]

Seventeen years have passed since H. Daville first produced aluminum on a commercial scale; but the expectations regarding this very interesting and meritorious invention of the distinguished French chemist have not as yet been fulfilled. Although many of those expectations were somewhat exaggerated, they were not and are not so unreasonable as many people believed them to be; for a metal with so many valuable properties would be useful in many of the technical arts. Among these properties are a beautiful color that does not change in the air, nor yet in sulphurous exhalations, and further, remarkable lightness, an agreeable resonance, and a capability of being worked into any shape. Moreover, in the use or manipulation of aluminum, there have not hitherto been observed any deleterious effects.

It is generally conceded that the cost, and not the absence of properties which make other metals valuable, has prevented the more extensive application of aluminum; and the price, although it is considerably less than it was at first, has remained high during the last few years. The cost of production of this metal, which can only be effected by the use of sodium, cannot possibly be the only cause of its high price; for the commercial manufacture of sodium may be considered as a solved problem, and, as soda ash is very cheap, sodium might be produced at a moderate cost if the demand were greater than it is. Large production is caused by large consumption, and the use of aluminum has been hitherto limited, mainly because custom and use have opposed the introduction of such a novelty. Stories have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead, and the formation of verdigris on spoons of (alloyed) silver; and if people were only determined to produce these utensils from aluminum, all danger from poisoning would be removed, and they would have vessels the appearance and durability of which would scarcely leave anything to desire. They would be more convenient to handle than our light crockery ware, for they can be made as light, and, what is important, cannot be broken. Splendid pitchers, plates, goblets, lamps, etc., might be manufactured from deadened and embossed aluminum; and the lightness of spoons of this metal would make them more convenient than those of silver now in use. It is rather surprising that they have not yet been more commonly introduced, for people are generally more particular as to their spoons and forks than as to any other table utensil. In this case, it is not the price, but only prejudice, which presents itself as a drawback, for the price is only half of that of good silver; besides, the difference in the specific weights of both metals and the consequent cheapness in the use of aluminum are so great that, for the value of one silver spoon, at least seven equally large aluminum spoons might be bought. True, aluminum is neither a rare nor a noble metal, but it possesses nevertheless advantages over alloyed silver which give it a much finer appearance; it does not get black, nor does it form verdigris, and what it lacks in brilliancy and appearance, is well compensated for in its agreeable lightness. Otto says very truly: "If spoons of aluminum were even more beautiful and durable than silver spoons, they would nevertheless not be used in the households of the wealthy, merely because they are cheaper than silver spoons. It is surely more agreeable to hold a light spoon than a heavy one, but the silver spoons are made as heavy as possible, and tea spoons are made as large as children's spoons to exhibit the wealth of the owner. The larger the spoon, the wealthier the man." We may let time conquer these prejudices, and hope that all-subduing fashion will make itself useful in this field.

The more important question which now deserves our attention is: Whether it be not possible to plate certain metals and alloys, of unsatisfactory color or which are subject to changes in the air, with aluminum, so as to give them, at least superficially, the advantages and properties of this beautiful metal? For this purpose, as so small a quantity is used to cover a large surface, the present high price would not be any drawback; and the question now remains: Is the coating of ordinary metals with aluminum practicable? This question has lately been propounded in the *Deutsche Industrie Zeitung* as follows: "Does any one know of a recent and reliable process for electroplating other metals with aluminum or its alloys?' This question must be answered in the negative. There are, in general, two methods known, which are employed to coat one metal with another, namely, the galvanoplastic process and plating with foil. The separation of aluminum by the galvanic current succeeds only when the anhydrous double salt of chloride of aluminum and sodium is used; this salt melts at 185° C., and thus an incoherent coating only is obtained, which, besides, contains chloride of sodium, and is in no wise durable. From watery solutions, aluminum has not as yet been precipitated in a metallic state, and Gore certainly errs in stating that, with a weak current, copper may be plated with aluminum. In regard to plating with foils of this metal, it is possible in some degree, but the resulting product is perfectly useless. Plating in this manner requires a sort of brazing and a final intimate unification of both metals by rolling, and these conditions cannot be fulfilled with aluminum. As is well known, the ductility of this metal is almost destroyed by only a small admixture of other metals; iron makes it fragile, and copper imparts to it the brittleness of glass. Although it is possible to melt a sheet of aluminum upon another metal, an alloy is formed at the surface, by contact of the two metals, which possesses no ductility whatever, so that rolling crushes it to powder, and so the foil gets loose and separates. And, even if it were possible to plate with aluminum, it remains very questionable whether there would be anything gained. Aluminum in a compact form is very durable and not readily changed, either by oxygen or sulphur; but it is very changeable in a finely divided state. In sheets and powder it is very oxidizable, and when amalgamated, it heats spontaneously in the air and separates into alumina and quicksilver. The layer of aluminum on the plated metal would in any case be very thin, and it is probable that this otherwise unalterable metal would lose its durability by the extreme tenuity.

The Steam Excavator.

Mr. Issac Otis, of Houghton, Mich., writing to the *Railroad Gazette*, says that the Steam Excavator, now so commonly used, was the invention of his brother.

His name was William S. Otis, and at the time he was a resident of Philadelphia. The first machine was built for him by Eastwick and Harrison, somewhere about 1837, and they afterwards built several, including two for the Russian Government, which were used in the construction of the Petersburg and Moscow railroad.

Messrs. Eastwick & Harrison afterwards (in connection with Mr. Williams, of Baltimore) went to Russia, where they built all the locomotives and rolling stock of this great Russian railway.

Mr. Otis died in the year 1839: at the time of his death, he was one of the celebrated firm of contractors under the style of Carmichael, Fairbanks & Otis. Many of the foremost railroad contractors now living commenced as foremen for Carmichael, Fairbanks & Otis, among them such men as Sidney Dillon, O. S. Chapman and others.

These excavators have been, and are still, largely used in the construction of railroads and canals, and, in the shape of dredging machines, in digging out our harbors.

At the time of Mr. Otis's death, his firm were engaged in constructing some of the heaviest sections of the Boston and Albany railroad (then the Western railroad), and were using steam excavators; among other points, the sand cut, just east of Springfield, Mass., was taken out by one of these machines.

The cheapest work ever done in the United States, if not in the world, was in the filling up of the great trestle bridge at Girard, Pa., on the line of the Lake Shore railway. This embankment, of a million cubic yards, was made of earth dug by steam excavators. The contractors were Messrs. Dillon, Chapman & Clyde, and the work was done at a cost of not more than six cents per cubic yard, including digging, hauling and dumping, the contractors furnishing everything except the ties and railroad iron for the track.

The excavators are now built by Messrs. John Southern & Co., of Boston, cost about $8,000, weigh some 22 tuns, last indefinitely (some machines are still at work that were built thirty years ago), and will dig and put into cars 1,000 cubic yards of sand or gravel per day; in fact, about the only limit to their powers in soft digging is the ability to take the material away as fast as the machine can load it. They will dig the hardest earth, and in fact some kinds of rock. The shovel holds 1¼ cubic yards, and in sand they can fill this and dump the material into cars twice in one minute.

Three men are employed in running the machine, an engineer, cranesman and fireman; it consumes about one cord of wood per day, or its equivalent of bituminous coal.

They are locomotives as well as excavators, and can be fitted with extra wheels to run upon a 4 feet 8½ inch gage. They are used in working sectional tracks of 4 feet lengths, and after digging all the earth within reach move themselves up ready for a fresh bite; they make a through cut wide enough for a single track railroad without widening out.

Many railroads have them in use to load their gravel trains.

Cut Flowers.

Those of our readers, says the *Gardener's Monthly*, who live in what in a social sense we may call the country, have little idea of the growing immensity of the cut flower trade in the large cities. While it is believed that gardening as a fine art, or even the mere cultivation of flowers as a luxury, has not kept up in ratio with the increase of population, the mere florists' trade, that is, that which furnishes plants and flowers for temporary ornament and decoration, has probably doubled within the last ten years. Not only do florists grow flowers of their own in great quantities for baskets and bouquets, but many away from the immediate circle of the cities find it profitable to grow flowers to sell again to those who put them up; and even private gardens frequently contribute to supply the demand. Indeed the tendency of this division between the one who grows the flowers and the one who sells is continually growing greater. Land in the city is high and taxes heavy. Flowers are light and travel easily by rail or wagon, and thus can be raised to better advantage away from the expenses of a large town. The principal flowers grown for this purpose are roses and camellias, but heliotropes, violets and many other popular flowers come into good use. These leading flowers are sold at a price per hundred flowers—camellias in their best time wholesaling at about $20 00 per hundred, and roses at about half this rate. As a general thing, camellias are raised in pots or tubs, but roses are most generally grown in the natural ground under a glass house erected for the purpose. A rose house on this principle is a very pretty sight in the winter season—not quite as gay perhaps as its rival the camellia, but with a fragrance which, if plants have sensation as some wise folk tell us, the camellia doubtless envies. Many roses do not flower freely under glass in winter unless the houses are very tight, or unless they have some age. For most general purposes, Safrano, Bon Silene, Luxembourg, Isabella Sprunt, Archduke Charles, and Hermosa are popular, flowering young and freely where there is room, good light, and a year or two of age. Lamarque and Marshal Niel are great rose house favorites.

THE HEALTH OF THE WORKMEN OF THE EAST RIVER BRIDGE.

Mr. F. Collingwood, in a paper read before the American Institute of Civil Engineers, alludes to the adverse criticisms of the press on subterranean foundations, on account of the danger, to the health of the workmen laboring within them, by the pneumatic pressure, and cites, as a case in point, that of the caissons of the East River bridge. On the Brooklyn side, the men worked 8 hours, in two shifts of 4 hours each, down to the full depth of 44·5 feet without injury. On the New York side, the time was reduced correspondingly from 7½ hours at 45 feet to 4 hours at 77 feet. The first fatal case which was considered as fairly attributable to compressed air took place at a depth of 75 feet, from congestion of the lungs. The man was of full habit, and an examination of but two days before had proved his lungs to be sound. There were perhaps a dozen cases of paralysis, which all recovered in from three days to three weeks. At from 50 feet depth to the end, severe pains in the legs and arms were frequent, but did not last long. The remedies employed were ergot and morphine to alleviate pains in the limbs; stimulants, together with Jamaica ginger, were given for epigastric pains. Where vomiting set in and was persistent, paralysis frequently followed. Coffee was always served to the men immediately after coming out of the caisson, and bunks were provided in which all who wished could rest.

An important conclusion from the records kept of cases is that the greater number of those who have retained their health throughout are wiry, somewhat spare men; while most of the sick and all who died were fleshy men of full or large size.

The following are the rules for the workmen in the caisson: 1. Never enter the caisson with an empty stomach. 2. Use, as far as possible, a meat diet, and take warm coffee freely. 3. Always put on extra clothing on coming out, and avoid exposure to cold. 4. Exercise as little as may be during the first hour after coming out, and lie down if possible. 5. Use intoxicating liquors sparingly; better, none at all. It is dangerous to enter the caisson after drinking intoxicating liquors. 6. Take at least eight hours' sleep every night. 7. See that the bowels are open every day. 8 Never enter the caisson if at all sick. 9. Report at once to the office all cases of illness, even if they occur after returning home.

Steam on the Canals.

The Fountain City, a new boat, is the name of a new canal competitor for the $100,000 prize, which arrived at Albany recently, after a five days' trip from Buffalo. The propelling wheels are described as so arranged that the waves produced by one wheel are broken down by those from the other. Her speed averaged over three miles per hour. The wheel is said to have all the power of a screw in the fore and aft blades, and a square pull, in addition, by one of the side blades, and consequently will develope more power, it is supposed, with fewer revolutions per minute, than ordinary wheels.

Wooden Ware Works.

The Erie Wooden Ware Company's works, at Erie, Pa., occupy a main building 250×125 feet. They have one engine of 70 horse power; two pail lathes, one tub lathe, one automatic saw for broom handles, one broom handle lathe, two top and bottom lathes, three stave saws, one matcher for edging up, one planer, and three saws for slitting staves the right lengths. The workshops, says the *American Manufacturer*, are quite interesting and present a very pleasing picture. First the rough logs are cut up into required shape and length, and then, by a peculiar machine, the staves for the tub are cut from it in a slightly curved form, which entirely does away with the old system of bending them; and from one man to another the staves are handled until the rough pail is made or fixed together; then one man turns the outside with chisel and sand paper until perfectly smooth, and another does the same for the inside; then it sent to another department for the bottom and lid, and then for the hoops. Everything is in place, all are unusually intelligent men, and order reigns supreme. The whole implement reminds us of some magic apparatus. After being made in the shop, the pails are sent to a floor above where the handles are put on, and those intended for dairy purposes are taken to the painter's room, and after receiving his attentions are packed in another department for shipment. We were particularly interested in seeing the drying houses, situated some distance from the main building, of which there are ten, six of which are for steaming purposes, and four are operated upon by hot air, for which purpose the company have four separate boilers. There are constantly 50,000 feet of lumber, about 500 cords of pail bolts, and from 400 to 600 cords of cut staves being operated upon. The specialty of this company is in the manufacture of tobacco tubs, and they are certainly made with great skill and high-finished material. The company own 4½ acres of land here and intend to double the capacity of the present factory as soon as possible. They have sixty-five men and boys constantly employed, and have orders ahead; and, at present, their income exceeds $250,000 per annum. The officers are S. S. Spencer, president; G. W. F. Sherwin is general superintendent, and R. W. Flower, Jr., secretary and treasurer.

THE Academy of Sciences of Bologna, Italy, offers a prize of 1,200 francs ($240) for the best essay on the applications of galvanism. The papers may be written in Latin, Italian, or French, and must be submitted before June 30, 1874.

The American Pneumatic Railway Brake in England.

It is perfectly well known that it forms no part of the policy of this journal to advocate the adoption of patented inventions. It is our policy, however, to advocate the adoption of substantial improvements in the arts of construction, whether they are or are not patented. It is without hesitation, therefore, that we state our conviction that, by the adoption of such a brake as that recently introduced into this country by Mr. Westinghouse, collisions might cease to have any important existence. It is right that we should explain why we single out the Westinghouse from many other systems of continuous brakes, more or less efficient, which have been tested in this country. The reason is this:—No locomotive superintendent or manager is justified in incurring a large expenditure on an unheard-of or comparatively untried invention. We know nothing of the existence of any other form of continuous brake which has been so extensively used as that we have named. In their immediate effect, all continuous brakes are pretty much the same, when once the wheels are skidded. The difference lies in the means by which the wheels are skidded. We believe, in common with a very large body of engineers, that Mr. Westinghouse has solved the problem of constructing a good continuous brake. It is quite possible that a far better brake may be invented, but with this we have nothing to do. The Westinghouse brake has passed far beyond the limits of the first stage. Its construction occupies hundreds of hands and all the resources of a manufacturing establishment of great dimensions in the United States. All the principal American lines use it already, or are adopting it. Many hundreds of the little air-pumping engines have been made. The operation of the brake is eminently satisfactory. Why should it not be adopted extensively in this country? We are not hard to please; we do not, be it understood, write to advocate the adoption of the Westinghouse brake, but we write to advocate, nay, to insist on, the general adoption of a first class continuous brake on our railways, no matter who is the inventor, and we cite the Westinghouse brake because it affords a direct and complete answer to those who argue that there is no good continuous brake in existence, and that they will wait till one is invented and tested. We cut the ground from beneath these gentlemen at once, by asserting that all that can be required is provided ready to their hand. It remains to be seen whether, among the multitude of our readers, one can be found to argue that we have advanced a single statement which is contrary to truth, reason, and common sense.—*Engineer.*

Faraday and Field.

Dr. Gladstone, in his "Memoir of Faraday," just republished here by the Harpers, tells the following story, which is worth reproducing:—

"Inventors and promoters of useful inventions frequently benefited by the advice of Faraday, or by his generous help.

A remarkable instance of this was told me by Cyrus Field. Near the commencement of his great enterprise, when he wished to unite the old and the new worlds by the telegraphic cable, he sought the advice of the great electrician, and Faraday told him that he doubted the possibility of getting a message across the Atlantic. Mr. Field saw that this fatal objection must be settled at once, and begged Faraday to make the necessary experiments, offering to pay him properly for his services. The philosopher, however, declined all remuneration, but worked away at the question, and presently reported to Mr. Field: 'It can be done, but you will not get an instantaneous message.' 'How long will it take?' was the next inquiry. 'Oh, perhaps a second.' 'Well, that's quick enough for me,' was the conclusion of the American; and the enterprise was proceeded with."

Leaves for Flavoring.

The *Garden*, an English periodical, after remarking that leaves are by no means so much used for flavoring as they might be, adds the following practical suggestions:—

One of the most useful and common of all leaves for flavoring is that of the common syringa. When cucumbers are scarce, these are a perfect substitute, in salads or anything in which that flavor is desired. The taste is not only like that of cucumbers, but identical—a curious instance of the correlation of flavors in widely different families.

Again, the young leaves of cucumbers have a striking likeness, in the way of flavor, to that of the fruit. The same may be affirmed of carrot tops, which are as like carrots in taste as may be. In most gardens there is a prodigious waste of celery flavor in the sacrifice of the external leaves and their partially blanched footstalks. Scores of sticks of celery are cut up into soup, when the outside would flavor it equally well or better.

The young leaves of gooseberries added to bottled fruit give a fresher flavor and a greener color to pies and tarts. The leaves of the flowering currant give a sort of intermediate flavor between that of black currants and red. Orange, citron, and lemon leaves impart a flavor equal to that of the fruit and rind combined, and somewhat different from both. A few leaves added to pies, or boiled in the milk used to bake with rice, or formed into crusts or paste, impart an admirable and almost inimitable bouquet.

Moonlight Reflections.

When standing by a lake side in the moonlight, you see, stretching over the rippled surface toward the moon, a bar of light which, as shown by its nearer part, consists of flashes from the sides of separate wavelets. You walk, and the bar of light seems to go with you. There are, even among cultivated people, many who suppose that this bar of light has an objective existence, and who believe that it really moves as the observer moves—occasionally, indeed, as I can testify, expressing surprise at the fact. But, apart from the observer, there exists no such bar of light; nor when the observer moves is there any movement of this glittering line of wavelets. All over the dark part of the surface the undulations are just as bright with moonlight as those he sees; but the light reflected from them does not reach his eyes. Thus, though there seems to be a lighting of some wavelets and not of the rest, and though, as the observer moves, other wavelets seem to become lighted that were not lighted before, yet both these are utterly false seemings. The simple fact is that his position in relation to certain wavelets brings into view their reflections of the moon's light, while it keeps out of view the like reflections from all other wavelets.—*Herbert Spencer.*

Spectroscopic Observations of Fluorescent Light.

In a recent communication to the *American Gas Light Journal* by Professor Henry Morton, containing details of a variety of experiments on the above subject, the author says:

In addition to the vast field already occupied by the spectroscope as a means of discrimination, another useful though limited range may be given to it in connection with that remarkable property of matter, in relation to light, known as fluorescence. This action was first thoroughly investigated by Professor Stokes, who, in 1852, published in the *Philosophical Transactions* an admirable memoir on the subject, in which he conclusively showed that when blue or violet light fell on a vast number of substances it was absorbed and re-emitted; with, however, in all cases, a lowering of its rate of vibration, or in other words a change in its color, from blue or violet, to green, yellow, orange, or red. His observations showed that the colors emitted by different substances varied greatly, and when analyzed with a prism broke up, in many cases, into characteristic groups of bright colored shaded bands. The spectroscope had not then, however, been introduced, and having no means of exact measurement, his results were rather qualitative than quantitative.

B cquerel worked in the same direction and in the same way, until very recently, and several other observers had added more or less to our knowledge on special points.

Some time since it occurred to me that, if accurate measurements were made of the bright bands found in the spectra of fluorescent light emitted by various bodies, these might become a means of recognition and thus of qualitative analysis. With the assistance of Dr. H. C. Bolton, who kindly supplied me with a very large number of fluorescent salts, I carried out during the past summer a system of observation which developed several interesting results, among which, for example was this, that the presence of impurities could be detected in certain chemical salts, without so much as opening the bottles in which they were sold.

Origin of the Puddling Process.

Davy investigated the nature of the flame, and communicated his discoveries in a lecture before a large audience. He demonstrated that it was within our power to produce a flame which, at a state of extreme heat, contained either free oxygen or unburnt carbon; that a large grate with a limited supply of coal would generate the former, the oxidizing flame, while a small grate with a larger amount of coal would yield the other, the flame devoid of oxygen, but in which combustible substances might be melted without the danger of combustion. Among the hearers sat a young man by the name of Cort, who directed his mind to these remarks. Up to that time cast iron was converted into wrought iron by heating it with charcoal and exposing the melted metal to a blast of air. By this process only small quantities of wrought iron were obtained at a time, through the necessity of producing but one bloom in a heat, which might easily be hammered out; and also on account of the cost of charcoal. In this process, mineral coal could not be placed in contact with the iron, because the never failing presence of sulphur in that kind of coal would render the iron unfit for use. From Davy's lecture on the flame, Cort struck upon the idea of decarbonizing cast iron without exposing it to the danger of the contact with coal, by allowing the flames only of the coal to play upon the cast iron. Thus originated that wonderful operation called the puddling process.—*Mohr.*

Glass Spinning.

The latest improvements in spinning glass are due to the Vienna manufacturer Brunfaut, who has already exhibited his talent in this speciality in 1850 at Pesth. After manifold trials, he discovered a composition which may be made at any time into curled or frizzled yarn. The frizzled threads surpass in fineness not only the finest cotton but even a single cocoon thread, and they appear at the same time almost as soft and elastic as silk lint. The woven glass flock wool has quite recently been used as a substitute of ordinary wool wrappings for patients suffering from gout, and its use for this purpose has been, it is stated, successful. Chemists and apothecaries have found it useful for filtering. The smooth threads are now woven into textile fabrics, which are made into cushions, carpets, table cloths, shawls, neckties, cuffs, collars and other garments, etc. They may be used for weaving the figures in brocaded silk or velvet. As a material for fancy dresses, tapestry, for covering furniture, for laces, embroidery, hosiery, etc, the glass tissue will probably at some future time occupy a prominent place. Owing to its brilliancy and the splendor of its colors, it is the most beautiful material for dressing the hair, neck, and head. In softness, the glass yarn almost approaches silk; and to the touch, it is like the finest wool or cotton. It possesses remarkable strength; and it remains unchanged in light and warmth and is not altered by moisture or acids. Spots may readily be removed by washing. Being non-inflammable and incombustible, it is especially valuable for making dress materials for ladies. Clothes of glass fabrics are much warmer than those of cotton or wool; and at the same time, they are of low specific gravity. They are also adapted for veils, as they repel the dust remarkably well. The composition of the material is still a secret; and the spinning requires extraordinary dexterity and constant attention. This part of the business is said to be very trying to the sight. It is stated that, with a wheel of a diameter of five Austrian yards, one operative is able to spin 3,000 yards per minute. The *loth* (which is equal to about eleven drams avoirdupois) is sold for two florins—ninety-three cents gold. Some manufactures of glass yarn are sold at the following prices:

Bedouin tassels from 46 cents to 69 cents; eagle feathers from 37 cents to $1.39; ostrich feathers from 46 cents to $2.80; bouquets, 76 cents; cuffs, 1.15; ladies' neckties 70 cents; gentlemen's neckties from 46 cents to $2.30; watch chains from 23 cents to 93 cents; chignons from 46 cents to $4.60; trimmings 36 cents and upwards per yard; ladies' cloths from 12 to 18 cents per yard; ladies' hats from $4 60 cents to $14.40 cents. In conclusion, we may state that the Austrian Minister of Commerce has already organized schools for glass spinning in the principal seats of glass manufacture in Bohemia.

Cheap Life Insurance.

A novel form of life insurance policy was brought to our attention a few days since, and the inventor has secured it by copyright. By it, the insurance company is only liable for its assurance in case the protected party survives the assured, and thus the insurer is enabled to provide for his surviving wife and children at greatly reduced expense. By it, he does not risk spending his efforts on heirs who may not need the money or in whom he takes but a comparatively small interest. Further, if the insurer prefer, the policy provides for payment of an annual sum during life, instead of the whole at once.

The advantages claimed are such that, under ordinary circumstances, the company can afford to pay, to the protected party, an annuity equal to five times the interest of the sum now secured by a like premium. For instance, a man 30 years of age may secure to his wife of equal age an annuity during her life, after his death, equal to the income of $2,500, by an annual payment of not more than $12.50 (twelve dollars and a half) thus opening the privileges of life insurance to the poorest class. Life insurance companies may obtain full details of the proposed new scheme by addressing the inventor, Henry H. Swift, Millbrook, N. Y.

Origin of Electro-magnetism.

The experiments of Volta resulted in the pile named after him. Two heterogeneous metals, such as zinc and copper, are immersed in a glass of water, to which a few drops of sulphuric acid have been added; both metals we connect by a long wire, and then we find the wire possessed of a new force which can transmit a motion through the distance of a hundred miles and over. For a long time, the voltaic pile had been the subject of unsuccessful experiments for the purpose of finding its relation to the magnet, to which, on account of its poles, it bears a certain resemblance. One day, Oersted, at a lecture in Copenhagen in 1819, noticed that a magnetic needle on his table was disturbed by a communicating wire that happened to pass over it. He removed the wire, and the needle resumed its polar direction; he then replaced the wire, and the needle again turned aside.

Electro-magnetism was thus discovered. At once he recognized the immense bearing of the phenomenon, repeated the experiment in presence of the magistrate, a notary public and other witnesses, and made a Latin affidavit; this places his name, for all time to come, among the benefactors of the human race. The advantage of his invention is enjoyed by all of us who daily read telegrams from distant parts of the world as if this rapid transmission of news were a matter of course. The wonder has become a fact of daily occurrence; it it rises with us and accompanies us through the day.

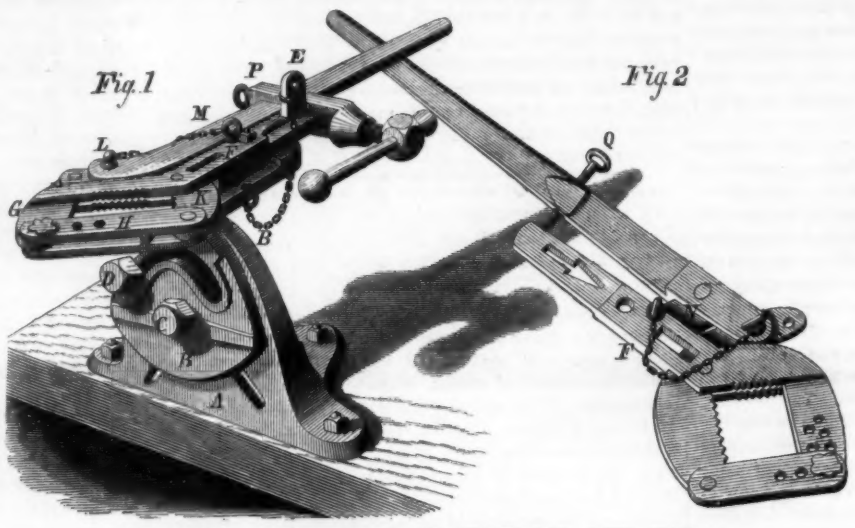
PREPARATIONS are being made at the Woolwich Arsenal for the erection of the 30 tun Nasmyth steam hammer, the largest ever constructed. It will be able to strike a blow equal to the weight of about 800 tuns, and the bed for the anvil has therefore to be of enormous strength. An excavation 45 feet square and 20 feet deep has been made, then piles, about 100 in number, driven into the solid gravel about 20 feet and the interstices filled up with concrete; on these was placed a block of iron 30 feet broad and 11 inches thick, weighing 160 tons, and on this two layers of oak balks. On this timber was next placed another iron plate, 10 inches thick and 27 feet square, weighing 121 tuns, and then followed a number of oak balks as before, standing vertically and bound together with wrought iron bands. Two more iron plates, weighing together 214 tuns, have also been lowered upon the oak balks, and one heavier than any yet placed will shortly follow. Upon this the anvil block, shortly to be cast, which is to weigh 102 tuns will rest, and it will be surmounted by the anvil face, which will be 12 feet in diameter and weigh 60 tuns.

MR. A. D. BREAZELE, of Alabama, has patented a mosquito frightener composed of the following formidable ingredients: Oils of pennyroyal, savin, origanum, terebinthe and sassafras, tinctures of lavender, chloroform and arnica; gum camphor, niter, alcohol and kerosene oil. If the Alabama mosquitoes can stand such a preparation as the above, they are proof against anything, and the only remaining thing to be done is to set mouse traps to catch them.

COMBINED PIPE WRENCH AND VISE.

The device illustrated herewith is an ingenious combination tool, which may be used either as a vise for holding gas pipe while cutting screw threads upon it, as shown in Fig 1, or it may be detached (Fig. 2) from its stand and employed as a gas pipe wrench, or square wrench for large bolts.

A (Fig. 1) is the bracket secured by bolts to the bench. B is an angle plate pivoted to the bracket by the bolt, C. By the curved slot in the former, through which passes the bolt, D, the tool may be inclined as required. B' is the upper and horizontal portion of the angle plate, to which the instrument is detachably secured by the bolt, E, through the bar, F. The forward end of the latter is inclined, and upon it are formed teeth. G is a bar, one end of which is rigidly fastened to the bar, F, and the other pivoted to the double bar, H. By means of the holes shown in H, the position and angle of the bars, H and F, can be altered at pleasure. Pivoted to the bar, H, is a curved bar, K, which passes through a slot in the bar, F, and has several holes in it to receive the pin, L, by which it is suitably adjusted to the lever, M. Upon the inner edge of the bar, K, are also cut teeth. The forward end of the lever, M, is slotted to receive the end of the short bar, N, Fig. 2, to which it is pivoted and which serves as a fulcrum. The other end of the short bar, N, enters a slot in the bar, F, to which it is detachably secured by a bolt. The lever arm, M, passes through a slot in the clevis, P, which has a vise screw, as shown, which, when turned inward, presses together the lever arm and the bar, F. By taking the tool from its support, and also removing the vise screw and other portions, substituting for the former the thumbscrew, Q, it becomes, as before stated, a square or gas pipe wrench.



NEAMES' COMBINED PIPE WRENCH AND VISE.

When used as a vise, this invention can be adjusted for holding pipe of various sizes, from three eighths of an inch to four inches. Employed otherwise, two sizes are all that are required, as it forms a square wrench, square to the diameter of the pipe. The inventor states that the tool is especially valuable in the sinking of pipes forming drive wells, the former, after being driven some time, frequently becomes stopped with fine sand, so that it is necessary to withdraw them. This, although it requires increased leverage, can, it is claimed, be readily done with the wrench by slipping a piece of gas pipe over the lever, while the compression on the pipe need not be increased. Using the wrench in this manner, it is stated that a drawn copper tube can be screwed together without injury.

The device can be used in closer quarters than ordinary gas tongs, as the grip can be loosened and another taken every sixteenth of an inch, around the periphery of the pipe, with absolute certainty. The instrument can be made to answer the purpose of a pipe cutter at a small additional cost. It is made of steel castings, and weighs, complete, seven and a half pounds.

Patented January 9, 1872. The inventor desires to sell the entire patent. Further information may be obtained by addressing Charles Neames, Lock Box 293, New Orleans, La.

Work and Play.

Men differ in their opinions in regard to what is work and what play. He who through the long summer day swings a sledge, pushes a plane, or follows a plow, naturally enough imagines that having nothing to do is a blissful condition of affairs, and that play is a state of rest or idleness; on the other hand, an able-bodied man, possessed of an active brain, finds doing nothing the hardest kind of work.

In these later years, no small amount of attention is paid to muscle. Brain feels the need of brawn. Vigorous physical exercise, even though it be for the time fatiguing, is not necessarily an unpleasant excitement, and the reward it brings, in red blood, digestion, and sleep, is well worth having. A great deal of our play is work of the roughest kind. This is true of rowing, swimming, ball playing, and a hundred other delightful exercises. He who follows a trout stream all day may call the sport by whatever name he chooses, but it is work nevertheless.

Of all work, brain labor is the most fatiguing. One can drop the implements of his trade, and the day's work is ended; but the cares of the office and the business across the threshold of home, mar the peace of the dinner hour, and frighten away sleep, or at least haunt one's dreams.

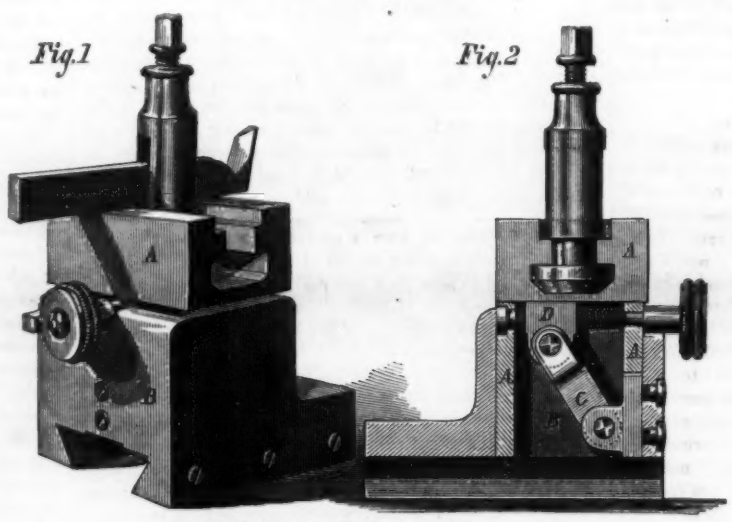
Work is agreeable and enjoyable very much in proportion as the object sought is desirable and attainable. It is not very much to be wondered at that men work with increasing earnestness as they achieve notable successes in life, for man is so constituted that he loves power, and money gives him this. The more money, the more power.

Habits of economy are very important in the relation they bear to the happiness of the individual. He who gains and holds has encouragement to go on gaining, whereas if one's gains slip through his fingers, so that he finds himself as poor at the end of the year as when he began, he naturally grows discouraged, and work becomes irksome.

The love of money may be, and without a question is, the root of much evil, but it is also the germ of much good. Wherever it exists, there are cities, commerce, manufactures, agriculture, education, art; and where it does not exist, there is barbarism. The right thing for every man to do is to try to get on in life. Considered by itself, a cottage and a narrow lot of land is a small thing to have in possession. But the man who earns a home by days' work, finds toil sweetened by the prospect of possession, and coming to it at length, even though it be humble, he is prepared to go on and accomplish better things in the future.—*American Builder.*

IMPROVED TOOL REST.

The principal defect of the ordinary form of tool rest is its difficulty of adjustment. It is fitted with no appliances for making slight changes in its position, particularly such as are constantly required in the execution of fine work, so that for every needed alteration, in the point of application of the tool, considerable time must be wasted in properly setting the rest. The device herewith illustrated, the invention of Mr. C. F. Hadly, overcomes this disadvantage in a very simple and effective manner.



IMPROVED TOOL REST.

Fig. 1 is a perspective, and Fig 2, a sectional view. The tool is shown held in a vertical slot in the upright standard by means of a screw bolt from above. This standard fits in a mortise in the upper portion of the device marked A, in which it freely moves, so that its lateral position may thus be adjusted. Pivoted on its end, as shown, to the interior of the metal sleeve, B, is an arm, C, the upper extremity of which is similarly attached to the movable piece, D. Through the latter, a thread is cut in which works the thumbscrew as represented.

The upper portion, A, of the instrument extends down inside the sleeve, B, in which it slides freely. It is evident that, by turning the thumbscrew, the piece, D, will be moved to the right, the arm, C, will be raised to a nearly perpendicular position, and the upper portion, A, carrying the tool, will be lifted. Opposite motion will, of course, take place by a corresponding reversal of the movement of the screw. The hight of the tool in the rest may thus be nicely graduated to any desired position, without necessitating the removal of either tool or rest from the machine.

For further information address the manufacturers, the Ames Manufacturing Company, Chicopee, Mass.

CORUNDUM OF NORTH CAROLINA AND GEORGIA.

Professor Charles U. Shepard, Sen., of Amherst College, states that corundum has been recognized for above thirty years at several of the gold washings in the mountainous counties of North Carolina and Georgia, though rarely occurring in masses larger than would be called a coarse gravel. The corundum localities occupy a section of country 170 miles in length and of about 10 miles in breadth, situated in a subalpine region, partly within the northeastern corner of Georgia, and extending thence, in the direction of the crest of the Blue Ridge, into several counties of North Carolina.

Corundum is known to occur only in a single formation, which may be designated as chrysolitic rock—which exists in lenticular beds inclosed in the prevailing gneiss. The principal exposure of the corundum has been effected at the Culsagee mine in the township of Elegée, in Macon county. The chief excavations have been made on the northern slope of a mountain at an elevation of about 2,700 feet above tide water. The workings have been carried down to a depth of about 50 feet.

The form of corundum crystals is that of six sided prisms or pyramids, sometimes the two combined, exhibiting occasional triangular faces belonging to the primary rhombohedron. The crystals are remarkable for showing cleavage lines, whereby their faces are transversely ruled off into lozenge-shaped areas. The prevailing colors are blue and red. The blue is intense only in small patches, and shades off into gray or pale yellowish gray. The tendency to cleavage renders the crystals unfit for purposes of jewelry. In size they vary from a quarter of an ounce up to a pound in weight, though the latter are rare; while two have been found of extraordinary magnitude. The largest of these is red at the surface, but bluish gray within. Its general figure is that of a six sided pyramid, and it weighs 312 pounds. The smaller crystal is 11½ pounds in weight, is a regular hexagonal prism, and has a grayish blue tint.

A Distilling Stove Wanted.

We have entertained a pet project for the last twenty years, not that we expect to carry it out and make a hundred thousand dollars ourselves by it, but whoever will do it will make all the money he needs. Our project is this: let there be a cooking stove so constructed that water can be distilled. Then rain or any other water, from a puddle, brook, or pond, or brackish well, or sea water, might be used, and the fire which warms the house and cooks the food can be made to distil all the water the family might require for cooking and drinking. This apparatus should be so constructed as to be simple, easily attended, not liable to accidents, and not to increase the cost of the stove more than ten or fifteen dollars. It can be made larger and more elaborate for hotels and large families, and the extra expense would, in such cases, be easily borne.

Who will put his wits to work to make this invention, thereby securing a fortune and ministering to the health and happiness of millions of human beings?

Who will study and work out the invention and, while thus doing good, get abundantly paid for it? A cheap invention to give to the great West pure water in every house would be worth to the nation more than a sum equal to our national debt. Who can estimate the health of an empire in money? —*Phrenological Journal.*

Joint for Earthenware Pipes.

The parts of the pipes which are in juxtaposition are cylindrical, scored on their exterior surface, and covered by a socket of greater diameter, having at its two extremities two flanges which fit the cylindrical surface of the pipes. A rectangular opening at the upper part of the socket is intended to give passage to the liquid cement which fills the interior of the socket and penetrates into the scoring of the pipes. When the cement is dry, the compact whole, formed by the pipes, the socket, and the cement, affords a perfectly water tight joint. There is, however, one precaution to be observed in the manufacture of this joint. The cement must be prevented from running into the interior of the pipe through the space left open between the two ends to be joined. This is effected by an india rubber ball fixed to the extremity of a tube, the other end of which is provided with a tap. The ball is introduced uninflated into the interior of the pipe at the part where the joint is; it is then inflated, the tap is closed and the cement is poured in. The inflated ball prevents the cement from running into the interior of the pipe. When the cement is dry the tap is opened, the ball becomes disinflated, and is withdrawn.

These joints have resisted pressure of thirteen atmospheres, attained in experiments with an hydraulic press. In practice, however, a much lower resistance must be anticipated. Besides which, earthenware pipes cannot of themselves support such high pressure as in these exceptional cases, and it is useless to require from the joints a resistance greater than that of the pipes.

AT the shops of the London and Northwestern railway, at Crewe, England, steel axles are rolled in rolls having grooves of varying depth by which necessary variation in diameter is given. Axles of any length can be rolled, and with collars at any part. This method not only saves time and produces an axle of superior finish, but also, it is said, prevents the flaws which occasion so many accidents to trains.

ROAD-BUILDING IN THE CAUCASUS.

The military engineers, who during our late war found themselves compelled at times to build roads over all but inaccessible localities in the mountainous regions of Virginia, Tennessee, and the Carolinas, will doubtless admit that, though arduous as their labors may have been, the exercise of no such consummate skill was required as was necessitated in the construction of a substantial way over such precipitous steeps as are represented in our full page illustration. In fact, if we may judge from the delineation presented, the threading of such mountain fastnesses seems impossible save to goats or chamois, and yet history tells us that the work was not only undertaken, but carried against every obstacle to successful completion.

The military path, represented as in course of construction, was projected by the Russians in order to carry their vast army, operating against Schamyl the famous Circassian chief, across the Caucasus Mountains. This range lies in the east of Russia, where the bleak, inhospitable climate added still further difficulties to the many already to be encountered by the engineers; but after a lavish expenditure of skill, money, and human life, the forces of the Czar succeeded in building a solid and enduring road, which, extending over crags and across crevasses, eventually afforded a means of cutting the enemy off from his base of supplies, and so victoriously ending the war.

Our engraving gives an excellent idea of the mountain declivities, into which the path had to be fairly carved or hewn, through the rock of summits elevated far above the plains below.

[From the New York World.]

PROFESSOR TYNDALL'S FIRST LECTURE IN AMERICA.

Professor Tyndall made his debut before an American audience on the evening of October 15th in the hall of the Lowell Institute, on Washington street Boston. It was packed with people, and his reception was exceedingly warm and hearty. The tickets to the lectures, which will continue for six alternate nights, were given out the previous morning, and twenty minutes sufficed to dispose of them all, although but one ticket was allowed to each person. The lectures are free, and are the gift to the public of this splendid institution, which does in another way something of what the Cooper Institute does for New York. The front seat at these lectures is always for Mr. Lowell's friends, and among those who attended him to-night were Robert C. Winthrop, Josiah Quincy, Professor O. R. Gray, of Harvard College, Dr. A. P. Peabody, Professor John Fiske, Rev. Dr. Neale, and many other distinguished people. Otherwise it was a typical Boston audience. Though so exceedingly plain, the hall is well adapted for the purposes of a popular lecturer.

Professor Tyndall's apparatus was arranged chiefly upon a large table, arranged as three sides of a square, in the center of which he stood while speaking. A long, narrow bridge was built out from the front of the platform over the heads of his audience, and on this was placed the auxiliary instruments with which the professor produced his most brilliant effects, in analyzing a ray of light upon a canvas at the back of the platform. He was as prompt as his audience.

At half-past seven he emerged from the anteroom and began to talk in a rapid, unassuming, polished way of the circumstances of his coming to America.

In person, Professor Tyndall is a gentleman of medium hight and rather slight in build. His features are shrewd and kingly, and his manner betokens the accomplished and genial gentleman. He was clad in a full evening dress, and was followed by his two assistants, who were kept busy throughout the evening in preparing for his experiments. With that happy faculty of speech which is his most charming trait, the Professor settled down immediately into the good opinion of his hearers, who cheered him so warmly that he intimated at once that he felt quite at home.

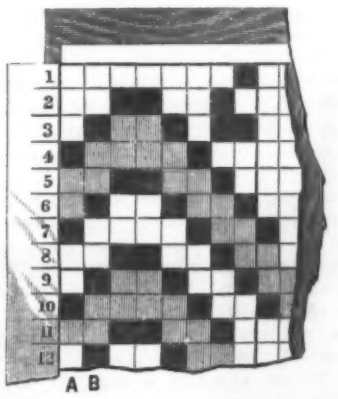
He told how, many years ago, he was besought by Mr. Lowell to come to America, and how last year the summons came with such a force from many distinguished men that he could not longer resist it. So here he was before a Boston audience. He spoke of his indebtedness to Mr. E. L. Youmans and Professor Henry; and, when the ice was fairly broken, he set his assistants to work, and, while they were preparing the batteries and wires and electrical lamps and prisms, he gave a little discourse on the pursuit of science for the truth's sake, vindicating the investigator and claiming for his apparently aimless labors an importance equally as great as the practical work of the worldly without the scientific experimentalism of 300 years ago. He showed there could be no industrial England or industrial America to-day without such labors. Next he spoke of the importance of the work of the scientific demonstrator, and then turned to his instruments. His lectures, he said, were to be confined to the exposition of the laws of heat and light.

By the aid of a platinum wire and battery, he explained the electrical light which he uses in all his experiments. B dding the gas glare begone, he caused a platinum wire, stretched across the table in front of him and no thicker than a horse hair, to glow with an intense brightness and then melt by electricity, which sufficed to demonstrate the principles of electrical action. Then substituting his lamp for the circle of gas jets of the hall, he proceeded by a series of rapid and beautiful experiments to analyze a ray of light. Through a tiny aperture in a bit of tinfoil, he took the single ray and showed the process of combustion and the laws of refraction. Then with a prism he resolved the ray into its component fragments, and afterwards gave the synthesis of light, by those wonderfully brilliant and marvellously simple methods which have given him a world-wide reputation as the greatest living popular scientific demonstrator. His fascinated audience cheered him to the echo, and went away to hunt up new adjectives with which to praise him.

HOW PATTERNS IN CARPETS ARE MADE.

The following description, gleaned from notes made of an interesting visit to one of the largest carpet manufactories, that of the New Brunswick Carpet Company, in the vicinity of New York, is of course not applicable to all the different varieties of floor coverings found in our large warehouses. For the kinds known as tapestry Brussels, it is, however, in the main correct, while it will give a general idea of the ingenious processes in an industry which, in this country, is rapidly assuming extended proportions.

In carpet manufacture, two principal materials are employed: carpet worsted for the warp and a coarse cotton packthread for the woof. The latter, previous to being used in the loom, is starched by being conducted from its spools down into a starch trough, after its exit from which the superfluous mixture is removed by pressure of rollers, and the fibers laid by revolving brushes, after which the thread is allowed to dry. This portion of the fabric, however, plays no part in the formation of the pattern, so that our attention must be directed to the worsted and the different manipulations through which it passes. First in order is scouring and then bleaching, leaving the wool pure and white. Meanwhile, the artist is preparing a pattern. This he draws on paper, marked in a peculiar manner. The sheet is just the width of a breadth of carpet, and is divided by printed horizontal and vertical lines into a number of squares, each of which is about an inch in dimensions. Each of these divisions is subdivided into several smaller squares; for example, eight on each side, or sixty-four in all. This may be better comprehended by examining the paper patterns used as models for embroidering on canvas. The artist, in coloring his design, lays each tint over so many squares, thus making the picture, as it were, a mosaic of small blokcs of different hues. The pattern, when completed, is pasted on a thin board, varnished, and then cut into longitudinal strips, each of some six inches in width. These are passed to the workman whose duty it is to make a record of the colors on each thread.



This operation is somewhat complex, so that, to make it clear, we must refer to the accompanying small engraving. A section of the pattern divided into squares, as above described, is represented. The first perpendicular line of small subdivisions, marked A, represents one thread of warp, B another and so on. Beside this first thread is placed a paper gage, as shown, numbered perpendicularly and divided off to correspond with the small squares. The workman now notes down the different tints on thread A, corresponding to the subdivisions of the gage. Thus, in our engraving, 1, 2, and 3 are white, 4 is black, 5 and 6, for example, red, 7 black, and so on in regular order throughout the whole length of the pattern. Then the gage is applied to thread B, a similar memorandum made, and this is repeated throughout the whole design. Consequently, when this work is completed, there are as many memoranda as threads of warp; as there are eight threads to a square, and, for instance, 27 squares is the breadth of the carpet, there will have to be made no less than 216 different records.

During the above operation, the worsted is being wound about a number of large wooden cylinders, each of which is some six feet in width and of a circumference equal in length to three times that of the design. Why this is the proportion we will shortly explain. The wool is laid on smoothly in a single layer over the whole periphery, but is divided into a number of skeins, each of which may be separately removed. All of the worsted on a single cylinder is dyed according to the memorandum of one thread; so that there are 216 windings of worsted, and consequently that number of repetitions of the dyeing process.

The pattern, as drawn by the artist, represents the finished carpet; therefore, in dyeing threads, allowance must be made for the extra amount doubled up, so to speak, in the finished fabric. In other words, space corresponding to one small square, as indicated by the paper gage, must be considered and allowed as three times the size, in the unwoven warp, and consequently on the cylinder. Around the edge of the latter is attached a series of teeth all numbered exactly similar to the gage. On the principle above stated, the distance between any two of these teeth is made three times that between any two numbers on the gage. These teeth engage in a ratchet which, worked by the operative, holds the cylinder at rest at any desired point. Under the cylinder is a track, on which is a carriage actuated by a belt moved by steam power. In the carriage is a pot of dye in which rotates a wheel which has a circumference of rubber or other suitable material. The wheel dipping in the dye also rubs against the worsted on the cylinder above it. The width of the edge of the wheel is exactly equal to the distance between two of the teeth on the edge of the cylinder.

In beginning the operation, the workman turns the cylinder until the tooth marked 1 is directly in line with the dye wheel—this is indicated by suitable means—so that the latter will, if set in motion, draw a line lengthwise the cylinder from that point. Let us suppose that the dye is red and the first thread, A, to be the one under operation. Referring to the engraving, we find that the first three divisions are white; they need no dye, so the cylinder is turned until the first red point (No. 5) is reached. Now the machinery underneath is started. The carriage runs along the track and the wheel leaves a red line across the worsted. The next space is also red; the workman rotates the cylinder ahead one tooth, and again sets the wheel in motion; the red line is now twice as wide as before. Then he goes on to the next red space, and so on until all are marked. A pot of black dye is substituted; the cylinder is turned back to tooth No. 1, thence on to No. 4—the first black space according to our memorandum; and thus the work continues until all the colors are printed. The skeins of worsted, between which and the surface of the cylinder is a sheet of oil cloth, are easily slipped off. They are then placed in a steam bath. Chemical decomposition ensues, the base or mordant is precipitated in the cells of the wool and becomes the chemical reagent for absorbing or reflecting the different quantities of rays of light according to the base and dye used; so that, when the worsted, emerges it is ready to be rewashed and, thus cleansed from the glutinous matter, employed to hold the base and dye in place during the printing and steaming processes.

The above operations are repeated, differing of course for every thread. Finally, when all is completed, the skeins are placed on an apparatus which winds the worsted on spools. This requires great care, because an exact point on every thread must be determined, which must correspond in all, so that when they are laid side by side the pattern will be plainly formed. This point is marked while the worsted is on the cylinders, in a manner which renders it easily detected.

Each thread is wound on a separate spool, which is numbered, that holding the thread furthest on the left of the pattern being No. 1, on the right No. 216; the others are intermediate. All the spools are placed upon spindles in regular order on a large movable table. The end of each thread in proper order is led through an orifice in a metal reed and fastened on a large beam. As the threads are side by side, the pattern is corrected by girls who, with the design before them and further assisted by the threads passing over a setting board correspondingly divided off into squares, readily place them in proper relative position. As fast as a certain length of pattern is arranged, it is wound on the beam, and this continues until all the threads are expended. The beam then is placed in the loom, where the worsted is arranged as the warp. The shuttles, carrying the woof of cotton and the filling, generally of jute, are in readiness, the almost magical machine is started, and, lastly, we see the material, that we have traced through its many processes, emerge in the shape of finished carpet.

THE MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

At the last meeting of the above society, held in Manchester, England, the subject discussed was the "steam jacket." The question at issue was whether the unavoidable liquefaction of steam, due to condensation from radiation, conduction and convection, as well as to work done, was to be allowed to take place in the cylinder itself, or whether it was more advantageous to employ a separate casing to supply heat to the steam inside the cylinder, and let the condensation take place in the casing, so that the propelling steam might be uninfluenced by loss of heat from convection.

During the argument, a speaker advocated the jacket because it was a safeguard against breakage, resulting so often from accumulated condensed water in the cylinder. This view was, however, strongly opposed. The result of the discussion was the general opinion of the members that no advantage could be gained from the steam jacket, nor did they object to its use, but they were convinced that efficient protection against radiation and conduction of heat from the cylinder was the best and only means to attain true economy.

The Good Butter of Philadelphia.

Many have been the attempts to account for the superior reputation of Philadelphia butter. Perhaps the most popular notion was that it was due to the prevalence in our pastures and hay-fields of the "sweet vernal grass," which often gives so peculiar a fragrance to meadow hay. But it needed very little reasoning to demolish such a theory as this. This grass is one of the poorest for hay or pasture purposes, and scarcely exists except on cold clay lands, in partially shady places near groves or low woods. We owe much more of the sweetness of our butter, suggests the *Germantown Telegraph*, to the abundance of springs and spring houses in our State, than to anything peculiar which grows in our pastures. Milk has a particular affinity for any odors in the atmosphere, and water has some; hence whatever impurities may get into the atmosphere of the spring-house are drawn out by running water, and the very best security is provided against their being absorbed by the cream.

SINCE the completion of the Mont Cenis tunnel, the quantity of wine imported into France from Italy, by that route has greatly increased.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Cheap Microscopes.

To the Editor of the Scientific American:

"This little microscope is an optical wonder. It reveals the thousands of hidden wonders of Nature; is of permanent use and practical availability. . . . It magnifies ten thousand times, a power which is equal to that of other microscopes of many times its cost. Price $3.00."

The above is the advertisement of a so-called microscope, which is so worded as to convey to novices in microscopy the idea that it is an instrument of real value and utility, and, without actually saying so (which would be a criminal fraud), the farther idea of equality in value to instruments of many times its cost.

Microscopes have now become indispensable to the physician, the physiologist and the naturalist; they are also an attractive educator in the school and the family, and their use and study form an elegant, delightful and instructive pursuit wherewith to occupy the leisure hour. Thousands of instruments are in use in Europe, and almost as many in this country, and the general use of them is rapidly increasing. But there are hundreds of youths, ambitious to procure instruments, who have not the slightest conception of the construction, performance or cost of a good instrument. Such are liable to be, and no doubt often are, misled by such claims as are advertised above, and it is the purpose of this paper to put them on their guard. Such an instrument is not an "optical wonder," is not of "permanent use" and is not of "practical availability." Neither can any microscope, made and sold at any such price, possess those qualities. It may magnify "ten thousand times" in area, but that is only one hundred in linear dimensions, which is the only nomenclature now in use by microscopists; and one hundred linear is a very low power in modern microscopy, where powers of 500 to 1,500 linear are in common use, and powers of 10,000 linear are not uncommon. Mere magnifying power is a comparatively unimportant matter. A good performance of 50 diameters is preferable to a poor one of 100 diameters. Such instruments are not corrected either for color or sphericity, and no good performance can be obtained without both. These instruments, from the above deficiencies, can be used only a very short time without injury to the eyes.

But how shall the inexperienced obtain a good instrument, or a best one? Of all instruments made, there is none of which there is such a variety of shapes and forms. Some of these are patterns made 30 to 50 years ago, and now utterly condemned by experts. Then the difference in quality is as great as the difference in form. What is the buyer (a novice, I suppose) to do? The best advice I can give him is to consult some friend who has used or knows all about the instruments of different makers, and has personal knowledge of the merits and demerits of different forms.

A recent writer on this question suggested that the best reliance of the buyer is on the reputation of the maker or the dealer. I regret to say that that will be a frail support on which to rely. There are very few dealers who really know anything of the qualities or properties of good microscopes. There are a great many makers in Europe, and, if one can believe their catalogues and advertisements, every one puts in the best work and makes better instruments than any one else; while it is notorious to many who have tried the instruments that some who make the greatest pretensions turn out the poorest work.

There are a few makers in this country who, I believe, make better work than the second or third class work in England; while some of them stand at the very head of the art. In the words of Dr. Barnard, President of Columbia College in New York city, in his report on the *Exposition Universelle*, Paris, 1867: "It is not necessary for Americans any longer to go abroad in order to obtain microscope glasses of any description of the highest order of excellence." But buyers of microscopes should not, must not, expect to obtain a good working instrument for an insignificant sum of money It is the instrument, if properly made, that involves the highest mechanical skill and scientific knowledge of any. No decent efficient instrument can be obtained under a cost of about $50, and from that the prices run up easily to $2,000. The only utility of such instruments as served for the text of this paper is that, now and then, they may come into the hands, or rather under the eye, of some one whose curiosity or interest may be excited enough to induce him to procure a real microscope. C. S.

Boston, Mass.

Splitting of Trees by Lightning.

To the Editor of the Scientific American:

I noticed in a recent number of the SCIENTIFIC AMERICAN an article which ascribed the splintered and shattered appearance of trees which had been visited by lightning as due to the sudden conversion of the sap into steam, and producing those results by explosion. Now this may be true in the live tree, but why does the same result occur in dead and seasoned timber? Whenever a mast or telegraph pole or fence is struck by a bolt, the same effects are produced; and I know of a fence in my neighborhood, that was struck last August, which was fairly converted into kindling wood for a part of its length.

I merely state these facts to show that, in trying to assign a satisfactory explanation of some phenomena, conclusions are sometimes made which may indeed apply in a cited case, and the same manifestations, which occur where the conditions are essentially different, are overlooked. H.

New Haven, Conn.

Changing Pay Day.

To the Editor of the Scientific American:

I notice several articles on the subject of paying men on Monday instead of Saturday. I have followed that course for several years. During the second year of the war, I found a great deal of trouble in keeping men, and in getting them to work on Monday morning. The railroad ran two trains through here on the Sabbath, morning and evening. Wages were high, work was plentiful, and men could get work anywhere and at any place. Getting their pay on Saturday night, with nothing to do on Sunday, some would take a trip on the cars and not get back in time for Monday or perhaps not at all; others would get on a spree and would not be fit to work on Monday. I at once changed my pay day to Monday; after that all hands were on hand on Monday morning, ready for their pay and for work. I pay my men during the morning while at work. Each man's money is put in an envelope and handed to him at his place of work, so he loses no time in getting his money. The plan works to my entire satisfaction. Some men do not like it, but I say to them that it suits my business and works well.

Geneva, N. Y. W. B. DUNNING.

Cider versus Juice.

To the Editor of the Scientific American:

Your correspondent, E. H., Oct. 12, is right. To obtain good cider, the expressed juice must remain a short time with the pomace, which has been crushed or bruised, not cut as is done by most patent cider mills. The old mills bruised the apples, the new ones cut them. We found, 50 years ago, that, with the advantage we then had of the old fashioned mills, it was better to grind or crush the apples and then let the pomace remain in the trough at least 10 or 12 hours; and if the weather was cool, let it remain 24 hours.

Lima, Ohio. A. G. K.

[For the Scientific American.]

Patent Extensions.

There has never yet been a government or institution of any kind which, though perfect in its vital organization and correct in its leading and great principles, has not had some weak point. So far as the history of the world has shown us, there never was anything, though complete as a system, perfect in all its details, always excepting the "wonderful one horse shay." And as we plume ourselves that the world is gradually approaching perfection, it behoves us to examine, critically and carefully, our old systems, that we may as much as possible correct their faults and verge nearer that desirable perfection. It is my object in this article to point out a hardship, suffered by an ingenious class of our citizens, which should receive the prompt attention of the Congressional Committee on Patents.

Patents prior to 1861 were granted to inventors for a term of fourteen years from their date; and the inventor was expected, within that time, to realize a sum sufficient to remunerate him for the benefit he had conferred upon the public, and the time, ingenuity, and money spent by him in costly experiments and introducing his invention into public use. Through poverty, and in some cases sickness, sometimes on account of the public not at first appreciating the value of the improvement, and at others through the machinations and combinations of unscrupulous capitalists who infringed his patents, his efforts were utterly futile, and toward the close of the term of his patent, he finds himself almost perfectly undone, and worse off than if he had never made the invention; but his energy and faith led him to persevere in it to the detriment of his other business. The inventor thus gets either nothing or a pittance of a few thousand dollars, for a benefit to the public of hundreds of thousands. Seeing the injustice of this, Congress has passed a law to protect him by granting him, on certain conditions, an additional term, or an extension of time for seven years more than the fourteen originally granted, making his protection in all last for a term of twenty one years in patents granted before April, 1861; since which time, in consequence of a second act, patents are originally granted for a term of seventeen years with no extension. But it is with the first that we have to deal. There remain yet about ten thousand unexpired patents granted between October, 1858, and March, 1861, inclusive, among which are thousands of patents covering valuable inventions whose inventors are in the condition set forth above; the original term of the last of these patents expires in 1875. These extensions are conditional, and it is at the discretion of the Commissioner of Patents that they are granted. If in his judgment the invention, the patent for which is sought to be extended, was not new at the time of its grant, or in other words, if it was substantially the same as a prior known device, or if the patent for any reason was bad when it was granted, he refuses the extension, and from his decision there is no appeal, and the protection expires. It is thus given to the Commissioner of Patents to decide finally a question equivalent to a question of infringement; a matter in which even the Judges of the United States Circuit Court are not given the power to make a final decision, as an appeal lies from them to the United States Supreme Court. This glaring example of one man power is not a state of affairs brought about after a long experience and established as a result of investigation and research; it is more the result of accident or oversight, in a department once considered of slight importance, but now grown, with all its defects clinging to it, into a vastly important branch of our governmental organization. Though the judgment of the present Commissioner is good, that of his successor may be poor and deficient; and the accidents and changes of life and office may place this successor in the Commissioner's seat at any time.

An appeal should be had either to the United States Circuit Court, to be tried as an ordinary case of infringement, with a second appeal to the Supreme Court, or it should be directly from the Commissioner's decision to the Supreme Court. Why cases of such difficulty and importance should be finally decided by the judgment of one individual who may in many instances be a political party appointee, entirely disqualified for such service, when cases of no more difficulty and often of less importance are submitted to a skillful judge or judges in the Circuit Court, with an appeal from them to the Supreme Court, is hard to understand.

Let the Congressional Committee on Patents bestir themselves and institute a reform in the matter, or the wrong will exist for three years longer, before the last of the extensible patents expires, and the highest talent and inventive skill will often go unrequited. TACITUS.

Patent Decisions of the Courts.—United States Circuit Court, Southern District of New York.

UNION PAPER COLLAR COMPANY *vs.* VAN DEUSEN *et al.*

BLATCHFORD, *Judge.*

The bill in this case is brought by the Union Paper Collar Company, a corporation, against Isaac Van Deusen and others, composing the copartnership of Van Deusen, Boehmer and Company. It alleges the infringement by the defendants of the following letters patent, named by the plaintiffs: Reissued patent No. 1,646, granted to Solomon S. Gray as inventor March 29, 1864, for an "improvement in shirt collars," the original patent, No. 38,961, having been granted to him June 23, 1863; reissued patent No. 1,828, granted to William E. Lockwood as assignee November 29, 1864, for an "improvement in shirt collars," the original patent, No. 11,376, having been granted to Walter Hunt as inventor July 25, 1854; reissued patent No. 1,867, granted to said Lockwood as assignee February 7, 1865, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned; reissued patent No. 1,926, granted to said Lockwood as assignee April 4, 1865, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned; reissued patent No. 2,306, granted to the plaintiffs as assignees July 10, 1866, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned, and a reissue thereof, No. 1,937, having been granted to said Lockwood April 4, 1865; reissued patent No. 2,309, granted to James A. Woodbury, as assignee July 10, 1866, for an "improvement in paper shirt collars," the original patent, No. 38,664, having been granted to Andrew A. Evans as inventor May 26, 1863; patent No. 56,737 granted to said Woodbury, as assignee of said Evans as inventor, July 31, 1866, for an "improvement in paper cuffs or wristbands," and reissued patent No. 1,980, and reissued patent No. 1,981, granted to said Lockwood as inventor June 6, 1865, for "improvements in collars," the original patent, No. 23,771, having been granted to him April 26, 1859.

The defendants admit, by a written stipulation, that they have infringed each and all of the said patents set forth in the bill "by making, using, and selling to be used the things respectively described and claimed as new." The contest is as to the validity of the patent.

The following is a brief of the decision:

The original Hunt patent having claimed a shirt collar composed of paper and muslin and polished and then varnished: Held, that, inasmuch as the collar is a complete article when it is polished or burnished, the varnish only adding further to its useful qualities, a reissue which omits from the claim all mention of the use of varnish is valid.

The Hunt reissued patent for a polished collar of paper and muslin sustained.

A starched linen collar with its surface embossed having previously existed, and also an imitative surface representing starched linen, there was nothing of patentable novelty in the idea of embossing such imitative surface as claimed in Lockwood's patent.

Printing having been done before on a smooth, white, enamelled surface, and a surface imitating starched linen being old, there was nothing of patentable novelty in printing upon such surface (as in Lockwood's patent), nothing being claimed as new in the appliances, machinery, or process for producing the printing.

Calling an embossed or printed collar (Lockwood patent), a new *article of manufacture* confers upon it no quality of patentable novelty, when there is no such novelty in the process or instrument for producing it.

The Lockwood patents for embossed and printed paper collars and cuffs declared invalid, as not covering patentable novelty.

The Gray patent for a turnover paper collar declared invalid by reason of prior inventions.

The Evans invention, as described in the reissue of July 10, 1866, defined to consist in the making a collar out of a long fiber paper possessing the qualities specified, and not in any process for making a paper possessing these qualities.

Collars having been made of other qualities of paper, and of other materials, the making of a collar out of this particular paper by a person who did not invent the process of manufacturing the paper itself, held not to be patentable.

Where E announced to C, a skilled paper maker, that he desired a paper possessing certain qualities, but made no suggestions as to the process by which it could be produced, and C succeeded in producing such paper after many experiments as to the character of the materials used and the mode of treating them. Held, that at the very utmost E can properly assert nothing more than that he and the paper maker were joint inventors of the paper.

The Evans patent of July 31, 1866, for a reversible paper cuff, held valid.

Wm. Whiting and *C. A. Seward* for complainants.
J. J. Coombs and *E. Wetmore* for defendants.

AT some of the English mines, steam, generated in boilers located on the surface of the ground, is conveyed in pipes to the engines within the mine. In one example the steam is conveyed in pipes of four inches diameter, through a total distance of 2,338 feet, and the loss of pressure is stated to be only half a pound per square inch.

A TURK TAKES A PATENT.—Among the patents issued September 24, by the United States Patent Office, was a grant to Mr. Ljubomir Klerij, of Belgrade, Servia, for a Drill for Boring Wells.

The Hardware and Metal Trades in England.

The last monthly report of Messrs. Blakemore in "Hardware, Metals, and Machinery," Birmingham, England, says:

The enormous demand for hardware and every kind of iron work, which for so long a period has prevailed, now displays many and unmistakeable signs of slackening. Few large orders are being given out, but producers are still heavily engaged, and the numerous orders for inconsiderable parcels of goods, which are being issued, show that the necessities of consumers are yet pressing, and that stocks everywhere are light.

Although the price of iron is now falling, the large establishments are too much occupied with orders received some time ago to permit of their accepting (in the face of a still rising market for fuel, raw material and labor) specifications at prices much under the makers' quotations given in the trade journals. It is only in second class qualities that any palpable reduction has so far to be reported; and, compared with the prices of best iron, what are called the common brands are at this moment disproportionately low. While best Staffordshire bars, for instance, are £16 12s. 6d. and £16, common bars may be had at £13 10s.. The relief to manufactures is, however, very slight; for goods of a reliable quality can be made only out of the more valuable descriptions of iron. What is true of bars is equally true of strips, hoops, sheets, and plates, and of the goods which are made from them.

Pig iron is twice the price it was a year ago; a similar rise has taken place in coal, and labor at the ironworks has advanced between 30 and 40 per cent. Pigs of a good quality cannot be obtained from the furnaces of this district, either by the finished iron makers or the engineers (for foundry purposes), under £8 a ton. Notwithstanding the quotations which these prices necessitate, some good foreign orders for massive goods are still reaching our leading machinists and engineers.

The establishments engaged in the manufacture of railway plant continue very busy. Steam, gas, and water tube makers have their books very full of orders for home and foreign markets; and, if they would accept orders for forward delivery, they might be obtained even at the existing high quotations. The edge tool firms are not busy, yet they have just been compelled to advance operatives' wages from 10 to 20 per cent.

Wares of the domestic class are keeping their producers in active operation. Great quantities of hollow ware are being sent abroad, and the demand for tinplate goods still exceeds the supply, while japanned goods continue to afford ample employment to their makers. It must be observed, however, that prices are not firm, and, though nominally unchanged, orders are being accepted at a reduction. The iron of which japanned goods are made has been reduced £2 in the month; but £29 a ton has still to be paid for that which twelve months ago might have been bought at £16. Then tin plates are 20s. a box dearer than they were a year back; and to keep them at that price, the makers have met, and 30 firms have agreed to employ their workpeople only four days a week, at the same time giving them higher wages. Further, English block tin, that in September, 1871, was £136, is now £158 per ton.

There is not much demand for builders' requirements; and, considering the price of materials, they are not dear, though much higher than in past times.

Galvanized goods keep up, though prices have a downward tendency for all but the best qualities.

There is an excellent demand for brass season goods, such as tubing, chandeliers, and the like. Owing to a sensible drop in copper, prices have been reduced about five per cent., and the further fall of £10 a tun, in the official quotations of English smelters, which has just been announced, would, in ordinary times, cause a corresponding alteration in the value of manufactured goods. But this is neutralized now by a general advance of 15 per cent in operatives' wages, which employers have been obliged, very reluctantly, to grant.

Notwithstanding the considerable advance the colliers have already obtained, those in this district are demanding an addition of 6d. a day, and in North Staffordshire a further 25 per cent. If their demands should be conceded, the price of coal will be again increased one or two shillings a tun, which may occasion some embarrassment to ironmasters and manufacturers, but need not trouble consumers. Such demands, though powerful to stimulate an upward movement in prices, are incapable of arresting a backward tendency when the flood has ceased and the ebb of the tide has manifestly begun.

Comet Prizes.

The Academy of Sciences of Vienna instituted in 1869, for the purpose of encouraging astronomers to search for comets, eight special prizes, which it has kept up each year since as part of its programme. Each of these prizes consists of a gold medal of the value of 20 Austrian ducats (between $45 and $50). They are intended to reward observers who discover a telescopic comet, or a comet visible only by telescope at the time of its discovery. One condition is that the comet has not previously been seen, and that its appearance has not been previously proved with certainty. The discovery should be immediately announced to the Academy by telegraph or otherwise without waiting for further observations, the Academy undertaking to notify at once to the different observatories the fact of the discovery. The place and time of the discovery ought to be indicated, as well as the position of the comet and its orbit as exactly as possible with the first intimation; the data should be completed at leisure by further observations if it be possible to make them. When the comet has not been seen by other observers, the prize will be presented only when the observations of the discoverer have been sufficient to enable the orbit to be determined. The prizes are decided each year at the general meeting of the Academy held at the end of the month of May. If the first announcement of the discovery reaches the Academy between March 1 and May 31, the prize cannot be decided till the following year.—*Nature.*

MALLEABLE IRON.

Mr. Russell W. Davenport, Ph. B., of the Sheffield Laboratory of Yale College, communicates to the *American Journal of Science and Arts* an interesting paper on a chemical investigation of some points in the manufacture of malleable iron. Analyses were made of two samples of ½ inch in thickness, each annealed twice and analyzed before and after each annealing to show what influence the process has upon the impurities contained in the iron. The material used was a fairly good charcoal iron, the unannealed castings showing a white fracture. The annealed castings, when broken, were up to the average toughness of malleable iron, and their strength did not materially decrease after the second annealing. The conclusions drawn were: first, that the silicon, phosphorus, and manganese are in no way affected by the annealing process; second, that the amount of sulphur is not diminished and may be slightly increased; and third, that the amount of carbon is reduced by each annealing until a mere trace remains. It appears that, when a casting does not exceed 1 8 of an inch in thickness, the carbon is approximately eliminated throughout the whole mass by the ordinary annealing process; when, however, the casting is thicker, the elimination only extends from the surface into the mass for a certain distance, but may be carried farther in by a repetition of the process. It would also seem that, in the interior of a thick casting, where the amount of carbon is at all events only partially reduced, that which remains is, by the high heat and subsequent slow cooling, changed its state of occurrence from combined carbon to a species of uncombined or graphitic carbon; for where the iron before annealing is white and very hard, after annealing it shows a dark fracture and is quite soft.

The manufacturers of malleable iron are occasionally troubled by a lack of toughness in the annealed castings when these are exposed to a sudden blow or a bending strain. This weakness is at times doubtless caused by the natural rottenness of the iron, owing to the presence of an excessive amount of silicon, phosphorus or sulphur; but it also must be frequently due to a crystalline structure, which the iron under certain unknown conditions assumes while being annealed. This structure shows itself in the fracture of an annealed casting in the form of bright crystalline faces, which occasionally extend entirely across the fracture. Analyses made afforded no explanation of this crystalline structure, so that its cause must be determined by future careful experimenting. Another analysis was made of an annealed casting which, when bent, showed a greater degree of toughness than common. It was of circular section, ½ inch in diameter, and was bent cold through an angle of 90° without showing fracture.

From this analysis, it was inferred that the silicon may run as high as 0·7 per cent without affecting the toughness of the annealed product, while it also tends to show, what might certainly be expected, that an iron low in phosphorus and sulphur is most suitable for making malleable iron.

NEW METHOD FOR SENSITIZING COLLODION.

"Dried carbonate of soda, prepared by heating a little of the best bicarbonate of soda to low redness for a quarter of an hour, eighty seven grains, dissolved in four ounces of water. Half an ounce of nitrate of silver solution, containing thirty-five grains of the salt. Mix half an ounce of the soda solution with the above; agitate with glass rod." The precipitate of carbonate of silver will subside in a few minutes; then pour off the clear liquid, add two ounces water, agitate, let it subside, and pour off the water. Wash the precipitate with half an ounce of spirits of wine; pour off and add half an ounce of absolute alcohol; agitate well and add the whole to two ounces of Wortley's uranised collodion. Then add, drop by drop, nitric acid to convert the carbonate of silver into nitrate, testing with litmus paper until a distinctly acid reaction is reached. The editor of the *British Journal of Photography*, in suggesting the above method, states that at no period of its preparation does this emulsion exhibit a tendency to precipitation. It is perfectly smooth, and not at all granular-looking. On glass, it gives a more dense film than the usual emulsion, and is free from air bubbles. On the whole, it seems to be a convenient, economical and reliable method, and in view of the increasing uses of sensitized collodions, is likely to be of value to photographers.

FILIFORM SILVER.—J. H. Gladstone has shown that metallic silver might be obtained artificially in the same filiform condition in which it frequently occurs in a mineral, and thus throw light on the origin of this native variety. Specimens of the metal were exhibited, from Korgsberg in Norway, associated with calc-spar, and from Chili, associated with greenstone, and in each case the silver resembled twisted threads or wires, noncrystalline but often bending at sharp angles. Under the microscope were exhibited precisely similar threads of silver produced by the decomposition of nitrate of silver by suboxide of copper. The latter substance is partly dissolved and partly converted into the black oxide, while filaments of the white metal shoot forth and bend in every direction. Most of these are extremely fine, perhaps $\frac{1}{25000}$ of an inch in thickness, so that, as was said, a grainme of such wire would stretch from London to Brighton. Since suboxide of copper is no rare metal, it seems probable that filiform native silver may often, if not always, originate from it.

The Manufactures of the United States.

The tabulation of the statistics of manufactures of the United States, for the year ending June 1, 1870, as returned at the ninth census, has just been completed at the Census Office. The number of establishments is 252,148; number of steam engines, 40,191, with a horse power of 1,215,711; number of water wheels, 51,017, with a horse power of 1,130,416. The average number of hands employed during the year was 2,053,988, of whom 1,615,594 were males above sixteen years of age, 323,768 females above fifteen, and 114,626 children and youths. The amount of capital invested was $2,118,247,069; of wages paid, $775,621,593. The value of materials consumed was $2,488,291,952; of products, $4,232,625,893. Of this production $13,040 644 is returned from Alabama, $185,410 from Arizona, $4,629,234 from Arkansas, $66,594.556 from California, $3,852,820 from Colorado, $161,065,474 from Connecticut, $178,570 from Dakota, $16,791,382 from Delaware, $9,292,173 from the District of Columbia, $4,685,403 from Florida, $31,190,115 from Georgia, $1,047,624 from Idaho, $205,620,672 from Illinois, $108.617,278 from Indiana, $46,534,322 from Iowa, $11,775,823 from Kansas, $54,625 809 from Kentucky, $24.161,905 from Louisiana, $79,497,521 from Maine, $76,593,613 from Maryland, $553.912,568 from Massachusetts, $118 394 676 from Michigan, $33,110,700 from Minnesota, $3,154.758 from Mississippi, $306,213,429 from Missouri, $2,494,511 from Montana, $5 788,512 from Nebraska, $15,870,539 from Nevada, $71,038 249 from New Hampshire, $169,237,732 from New Jersey, $1.489,863 from New Mexico, $785,194,651 from New York, $1.921 327 from North Carolina, $269,713,610 from Ohio, $6,877,387 from Oregon, $712,178,944 from Pennsylvania, $111,418,354 from Rhode Island, $985,898 from South Carolina, $34 362,626 from Tennessee, $11,517,302 from Texas. $2,343,019 from Utah, $32.184,606 from Vermont, $38,364,322 from Virginia, $2,851,052 from Wa hington Territory, $24.118,051 from West Virginia, 77,214,336 from Wisconsin, $765,424 from Wyoming.

Tempering Steel.

A valued correspondent, Mr. P. McCormick, of Newark, N. J., comments on the specification of Siegfried's patent, described by us on page 239 of our current volume. He states that he has been engaged in working steel for the past 30 years, and finds, in new processes, always the same story of "imparting extraordinary hardness and durability to the poorest quality of steel;" and he says that all external working of steel, after the forging is done, has but one effect, namely, that the outer portion cools and contracts first, and so impresses and compacts the interior, so that, when a piece is broken, it shows a closer granular appearance after dipping, but will often be so brittle as to break with a slight blow. And if annealed to its previous condition, it is no better than at first. He would like to know how to make poor steel into good steel, but fears that he will have to wait for the knowledge till he can go to Sheffield in a flying car driven by a perpetual motion.

The Coast Survey.

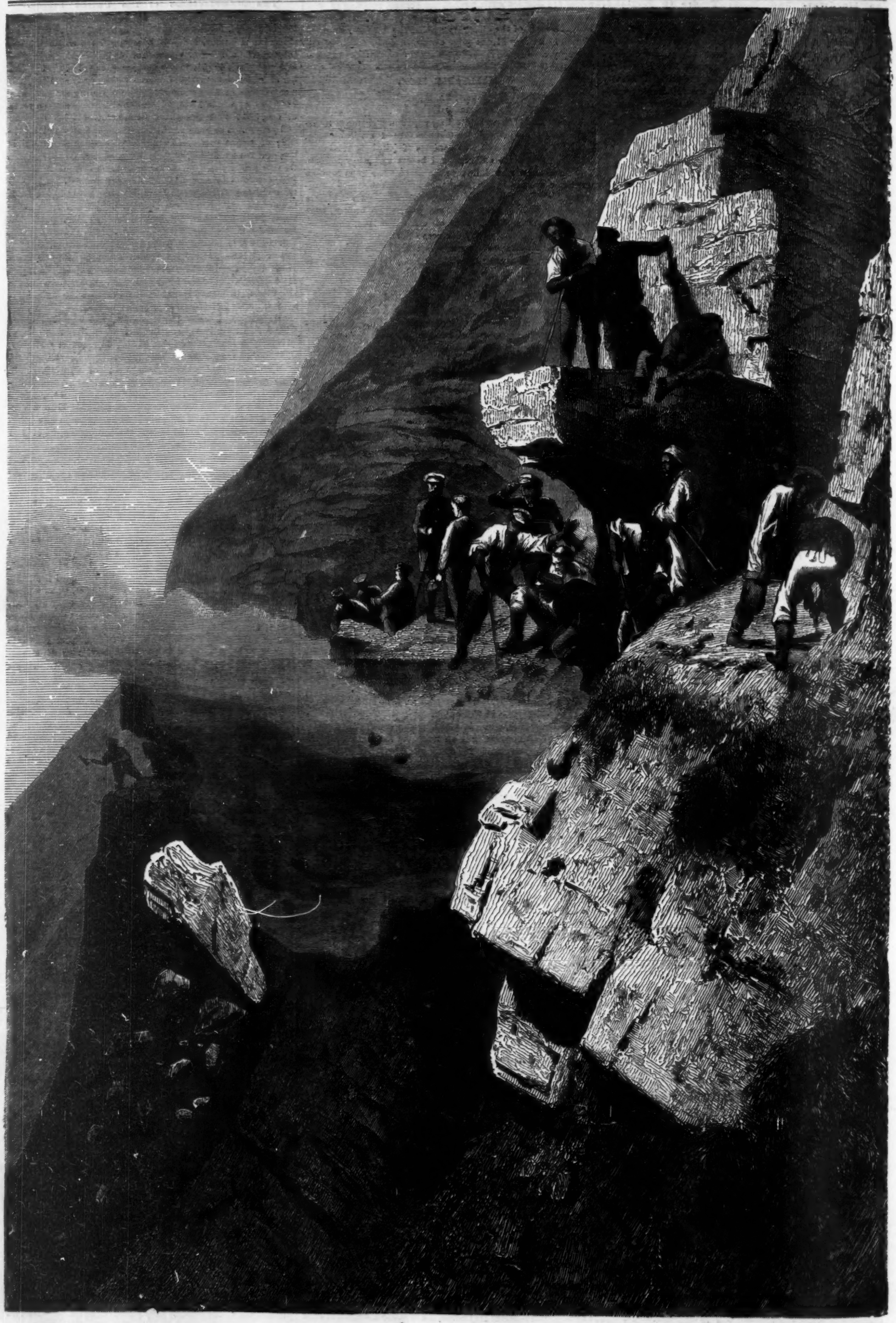
From the report of Professor Benjamin Pierce, superintendent of the coast survey, we learn the following:

In all the northern sections, parties are yet in the field and will so continue until the approach of winter, when operations will be resumed on the southern coasts. Work has also been done and is in progress along Lake Champlain. Magnetic elements have been determined in the vicinity of Philadelphia and at Washington, D. C.; tides have been regularly recorded at Old Point Comfort, Va.; a geodetic reconnoisance is in progress near Harper's Ferry; the detailed survey of James River, Virginia, has been extended upward to Warwick River; twenty new charts have been published during the year, and nine others, which show extensive additions in comparison with their first issue, and tide tables for the ensuing year have been prepared, and will be published as heretofore.

Caffein from Roasting Coffee.

Caffein is much employed as a valuable medicine, but, as now usually prepared, is difficult to obtain, and is very expensive. According to Thomson, the waste of this valuable alkaloid could be prevented in the process of roasting coffee if an adapter, nine feet long, were to be attached to the axi of the drum, through which the fumes could be passed and condensed. A pound of coffee yields, on the average, 7½ grains caffein. According to this, in England, with an annual consumption of 13,000 tuns of coffee, the yield would be 140 tuns of caffein. The United States would yield nearly as much more, so that a little economy in roasting coffee would give us a surfeit of this medicine, and very possibly result in its being found applicable to other useful purposes. Caffein is insoluble in a concentrated solution of carbonate of potash; it can therefore be separated by this reagent from sugar, gum, resins and extractive stuffs. If the tannic acid be precipitated from an infusion of tea or coffee by means of acetate of lead, and filtered, the caffein can be precipitated from the filtrate by carbonate of potash, afterward dissolved in alcohol, and obtained in crystals by sublimation. If an aqueous solution of caffein be evaporated to dryness in a sand bath, a few drops of chlorine water added, and again dried, a blood red residue will be obtained. In this way 1-1,000th of caffein can be detected.—*Journal of Applied Chemistry.*

WHERE personal interests come into play, there must be, even in men intending to be truthful, a great readiness to see the facts which it is convenient to see, and such reluctance to see opposite facts as will prevent much activity in seeking for them. Hence a large discount has mostly to be made from the evidence furnished by institutions and societies in justification of the policies they pursue or advocate.—*Herbert Spencer.*



RUSSIAN SAPPERS AND MINERS CONSTRUCTING A MILITARY ROAD IN THE CAUCASIAN MOUNTAINS.—SEE PAGE 275.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

PUBLISHERS' CARD TO ADVERTISERS.

A MILLION DOLLAR TELESCOPE.

The *Manufacturer and Builder*, in noticing the fact that Congress has appropriated $50,000 to pay for a 27 inch refractor for an Astronomical Telescope, calls attention to the want of liberality usually shown by our public men, in respect to expenditures for scientific instruments. It thinks there is no difficulty in obtaining money to build engines intended for destruction, such as monitors, but, when it comes to devices that are solely capable of adding to human knowledge and augmenting human happiness, then the purse strings are drawn tight, and money grudgingly given. Our cotemporary thinks that an appropriation of a million dollars to build a large telescope ought to be passed, and that science ought to be aided and encouraged in the same liberal style on all suitable occasions. The editor further believes that if such a telescope were to be capable of killing people at the rate of a thousand souls a minute, the million dollars would have been paid out and the machine constructed long ago.

It may be interesting, in regard to this matter, to give an account of the largest telescope constructed, and a few hints about what we may expect of a million dollar telescope.

The large telescope, commenced by William Herschel in 1785, was finished in 1789; its objective was a reflecting metallic mirror of 4 feet diameter and of nearly 2,000 pounds weight; the focal length was 36 feet. It magnified objects 6 000 times in their linear dimensions, or 36,000,000 times their superficial area. Herschel found, however, that the penetrating power depended on the size of the objective. A small objective of long focus causes the rays to be diffused so much that little light is left; and by using the telescope with different sized diaphragms, he found that, while with a small opening he could only see to a certain distance in the heavens beyond the stars visible by the naked eye, he saw much farther by using the full opening of his telescope. By the latter, he saw nebulæ so distant as to totally escape vision when using a diaphragm with smaller opening, which was equivalent to a smaller objective. He further found that some nebulæ could be resolved into stars, and others could not; and it was supposed that this was a confirmation of La Place's nebular theory, these nebulæ being assumed to be future planetary systems in their incipient condition.

The next large telescope was constructed by the late Lord Rosse. It had a reflecting objective of 6 feet diameter, and a focal length of 53 feet, and magnified objects over 10,000 times in linear dimensions, or 100,000,000 times in their superficial area. With this telescope, many of the nebulæ not resolvable into stars by Herschel's telescope were resolved, and it was a question whether all nebulæ could not thus be resolved, if only a still larger telescope than that of Lord Rosse was used.

This problem, however, has since been solved without building such a large telescope, as the spectroscope has proved that most of these unresolvable nebulæ consist of glowing hot hydrogen gas.

The magnifying power of a telescope is found by dividing the focal length of the eye piece into the focal length of the objective. It follows from this that the magnifying power increases with the focal length of the objective, which regulates the length of the tube, and is in an inverse ratio to the focal length of the eye piece. Some very long telescopes have been made, of over 100 feet length, mounted on a stick in place of a tube; but as the objectives were very small, the great magnifying power was counterbalanced by the small amount of light they received; and they had a total lack of penetrating power, and could be of use only for observations of such highly luminous celestial objects as the sun. For a successful instrument, the size of the objective must, therefore, be proportional to the length of the focus; and an objective of say 12 feet diameter, with a focal length of 120 feet, would be the thing to be desired, unless, indeed, these dimensions could be exceeded. If such an objective is ground to a very true parabolic curve, it can stand a very strongly magnifying eye piece, that is, one of very short focus. Suppose that the objective is so truly ground and polished that it could stand an eye piece of one twentieth of an inch focus, with which to magnify the image of the distant object formed in the focus of the objective; the magnifying power would then be equal to 120 feet divided by one twentieth of an inch, or 1,440 multiplied by 20—28,800 times the linear dimensions, or over 800,000,000 times the surface.

Such a degree of magnifying power would make the moon an interesting object for the geologist, showing the results of ancient volcanic action undisturbed by the effects of air and water. As the moon is at a distance of nearly 240,000 miles, a magnifying power of 28,800 would bring it to a distance of about 8 miles, and then the theory that the moon cannot be inhabited would be practically verified.

In regard to the planets, Mars would be brought to within 4 000 miles, and thus would be apparently 60 times nearer than the moon; and it would have a visual diameter of 50°, or 100 times that of the moon. As this is the only planet which, according to the latest scientific revelations, has conditions so similar to those of our earth as to make it highly probable that it is inhabited, the observations of the same would perhaps be the most interesting of all, as the works of men, such as cities and roads, could certainly be distinguished.

It is impossible to speculate on what such a telescope would discover in regard to the other planets or the vast regions of the firmament; let us hope that some day the amount of capital necessary will be forthcoming, on the most liberal scale, for the progress of the most sublime of all the sciences.

DOWNFALL OF THE PAPER COLLAR RING.

For several years past the members of a Clique, organized for the purpose of attempting the control of the Paper Collar business, and known as the Union Paper Collar Company, have set up and operated on the pretence that they were in possession of certain Patents which covered the exclusive right to manufacture paper collars. Anybody who made paper collars of any sort was, so they claimed, an infringer of their patents, notwithstanding the well known fact that such collars were known and used for many years before their patents were thought of.

By dint of threats of prosecution, and by actual resort to legal persecutions in some instances, this unscrupulous Clique has for a long time held sway over the smaller dealers, compelling them to take licenses and pay unjust tribute money or submit to the meanest annoyances. Indeed, some dealers have been compelled to abandon the business.

In view of these circumstances, it is with considerable satisfaction that we observe that the Collar Clique have at last been brought into Court, where their pretensions have been curtailed to reasonable proportions. We publish an abstract of the case in another column, from which it will be seen that their principal patent claims are declared invalid.

DISCOURAGING PROSPECTS IN ENGLAND.

The late English journals are filled with gloomy forebodings as to the prospects of the poorer classes and the working people for the coming winter. In the cities, and especially London, the repeated building strikes have brought poverty to hundreds; while in the rural districts, where the agricultural laborers have been carrying on a war for higher wages, acres of productive land have lain uncultivated during the best months of the year.

The potato crop, which forms a staple industry among a large number of farmers, has utterly failed. The London *Times* states that growing potatoes are offered at one shilling a rood, without customers. The produce should be worth ten shillings. The face of the country where the potatoes are lying is blackened, and in the most cases the stench plainly indicates the presence of the disease before it is detected by the eye. The retail price is one penny per pound, and the wholesale, seven pounds per ton instead of less than half that sum. An agricultural weekly estimates the loss, if the disease continues its spread as it bids fair to do, at 1,630,000 acres at 4½ tuns per acre, in all 7,735,000 tuns, which, at £4, comes to £30,940,000, or the value of say 10,000,000 quarters of wheat.

Various methods have been tried to prevent this fearful scourge, with but little success. Dr. Hooker, curator of the Kew Gardens, publishes, at the request of Premier Gladstone, the information that parts of the diseased vegetable may at least be saved, by grating and washing, thus extracting the starch. He also suggests that efforts should be made to spread among the poor the use, as food, of the beet root, and the foliage of the turnip and other vegetables, which are now given to cattle.

Another calamity is threatened in the shape of the foot and mouth disease among the domestic animals, which will result in the material increase in the price of meat. The London *Daily News* quotes from a Parliamentary speech, in which it is asserted that, in the five weeks previous, 10,000 cases of cattle and 50,000 cases of sheep had been returned as affected with this contagious disorder.

The outlook is further darkened by the probability of the price of bread being raised. A general strike of the bakers is threatened in London, which, it is feared, if carried into effect, will give rise to extensive and formidable bread riots.

In addition to these other evils, coal is selling at rates largely in advance of previous years. This may be accounted for, both by the troubles among the miners, large numbers of whom have struck for eight hours work, forcing many colliers into idleness, and also by the unusual demand for coal by the iron and metal working trades, the rate of whose yearly consumption has largely increased. Whether the advantage gained by the activity of these industries will compensate for the hardships entailed upon the poorer classes by the enhanced cost of fuel, is, as in all cases where one portion of a population is benefited at the expense of another, at best questionable.

With coal doubled in price, meat advanced and perhaps unhealthy from disease, potatoes, the great substitute for bread, scarce, and bread itself dearer, the prospect for the English working people is not very encouraging.

AN IMPORTANT PATENT EXTENSION DENIED.

The application of Perry G. Gardner, for an extension of his patent of Sept. 28th, 1858, for Improvements in Car Springs, has been rejected by the Commissioner of Patents on the ground that his statement of receipts and expenditures under the patent is vague and insufficient. The patentee granted licenses to use his invention to certain Companies, taking stock in compensation, and alleges that he has received no dividends therefrom; although nothing appears to show that his stock is not of great value, and no pretence is set up that the companies are not doing a profitable business. The Patent Office infers that the patentee has received a large remuneration for his invention, respecting which he withholds, in his statement, all information. Nothing is more common, says the Acting Commissioner, among manufacturing companies than to withhold all dividends, even while making enormous profits, devoting the latter to the enlargement and improvement of their works.

PROFESSOR J. H. PEPPER.

We are pleased to observe the arrival, in this city, of Professor J. H. Pepper, Director of the Royal Polytechnic Institution of London. He comes to this country on a tour of observation.

During his stay, we are to be favored with a few of those striking and marvelous scientific lectures for which he is celebrated, and which have attracted so much attention in London. The first lecture is announced for October 30th, at Steinway Hall in this city. Some of Professor Pepper's experiments with light and electricity are said to be quite astonishing, his appliances for direct illustration being very effective and original.

UNDERGROUND RAILROADS.

The London *Telegraph* gives a vivid picture of the horrors of the underground railroads of that city. It speaks of "the incessant hurry at the subterranean stations, the nerve shaking slamming of every carriage door, the hideous yells of the engines, the difficulty of distinguishing one train from another, or of getting a coherent answer to a question from the fevered and inarticulate officials," and says that "all these peculiarities, with the oppressive atmosphere and the spine-convulsing way of putting on the brakes, render the underground lines as terrible as they are useful."

Is the underground railroad which Mr. Vanderbilt is supposed to be building in this city, or to be making preparations to build, to be of this sort? Already we have troubles of our own in the way of travelling about the city. These are due in a degree to what some one has happily called the "natural depravity of inanimate objects," it is true; but they are none the less a grievance on that account, while the torments already inflicted on us by some of the horse car conductors, the stage drivers, and the hackmen, are worthy of the Spanish Inquisition in its worst days. But if the *Telegraph's* portrayal of the characteristics of the underground railroads of London be not wholly imaginative, what a pandemonium are we preparing for ourselves!—*Evening Post.*

The London Underground Railway is a model of its kind, pandemonium though it is, and the steam road proposed to be built in New York by Mr. Vanderbilt, will not be substantially different from that of London. The presence of the

locomotive in underground tunnels is always productive of many nuisances.

There is but one really practicable plan by which the annoyances recited by the *Post* can be avoided, and a rapid, safe, and agreeable mode of conveyance secured; and that is by the pneumatic system. A working section of this form of railway has now existed here for the past two and a half years, having been built at private expense, for the express purpose of showing to our citizens how excellent and practical the plan is, and how well adapted for the special purposes of rapid city transit.

The section referred to consists of a nine foot railway tunnel extending under Broadway from Warren to Murray street. A strong current of pure air, produced by a gigantic blower, moves through the tunnel, which is thus always kept thoroughly ventilated. A handsome passenger car, carrying twenty persons, traverses the track, being moved back and forth by the air current, which acts upon the ends of the car like the wind upon a sail. Many thousands of people have enjoyed the ride on this pneumatic railway, and have expressed their unbounded satisfaction at the complete, effective, and splendid manner of its operation. The noise, cinders, gas, dust, jerks, and other disagreeable accompaniments of the locomotive are done away with, while a speed equal to the ordinary steam train is easily maintained.

The practical success of the pneumatic method for passenger cars was long ago settled. It cannot compete, in the open country, with the locomotive, in point of economy; but for underground rapid transit, in large cities like New York, where the travel is immense and cars are to be dispatched every minute or two, the pneumatic system promises to be the most comfortable, and the expense of its running is estimated to be about the same as the locomotive plan.

One of the most singular circumstances connected with the introduction of this pneumatic system has been the action of the present Governor of the State, Hoffman. The amended charter of the Beach Pneumatic Transit Company, which gives authority to carry freight only, was signed by him. The great success of the method and the urgent demands of the citizens of New York for the application of the system to passenger transit induced the Company to ask an extension of their privileges to passenger service.

The plans of operation, construction, and route—the latter being from the Battery under the whole length of Broadway—have been widely discussed by the press and approved by the public. For two successive years, both branches of the State Legislature have, by very large majorities, passed the necessary measures authorizing the Company to proceed with its works and construct a passenger road; but each year the Governor has withheld his signature and vetoed the enactment, one of his chief assigned reasons being that a city engineer, an appointee of the notorious Sweeny, had advised him that the construction of the works under Broadway would be impracticable. This was in the face of the direct testimony of all the leading architects and several of the most experienced civil engineers that the construction was entirely practicable.

The Governor has, however, signed several other bills for steam roads in New York, one of which, the Vanderbilt, soon, it is said, to be commenced, is to run under Fourth avenue; another, the Swan Three-tier, that is, a combined underground, surface, and elevated steam railway, is to be located west of Broadway; another, the Gilbert, an elevated steam railway, also to be located west of Broadway. In addition to these, passed last year, the Governor had previously approved the Central Underground charter for a steam road, now nearly defunct by its own conditions; also the Sweeny Viaduct charter, for an elevated steam road.

The construction of every one of these roads involves more engineering difficulties than that of the Beach Pneumatic Transit road. The latter has the most central, the straightest and best route; this is admitted by all the engineers.

It will thus be seen that the city of New York is blessed with a superabundance of steam railway charters; but the only corporation that has so far actually done anything underground, to meet the wants of the public, is the Pneumatic Transit Company. It is a shame that the consummation of this important enterprise should be so delayed. The Legislature meets again in January, when a new Governor will be inaugurated. The Company will renew their application for the privilege of carrying passengers, and, as soon as it is granted, proceed with the extension of their works.

HANGING WALL PAPER.

Many persons living in remote places defer re-papering their apartments on account of the difficulty of procuring skilled labor in this branch of industry; but it is really such a simple task that there is no reason why any one of ordinary capacity should not do it with as little trouble as whitewashing. The directions here given are the result of practical experience and, if observed, will enable any one to hang paper as well as an expert.

Supposing you have decided to paper your apartment anew: the first thing to be done is to remove the old paper, if there is but one thickness on the wall, it is not necessary, as this will not do any harm. It is only where layer after layer is put on that the apartment becomes offensive from the condensation of vapors, accumulating with years until at last they become dangerous sources of disease. This is a well established fact, as recent investigation by a Board of Health in London disclosed that the several layers or thicknesses of wall paper, in houses in a crowded part of the city, were absolutely damp with noisome deposits accruing from defective ventilation.

To remove the old paper, take a common whitewash brush and a pail of water. Wash the wall all over and you can easily tear the paper off in long sheets and so render the surface clean again. Care must be taken not to remove or break the surface of the under layer, or ground; for if this is done, there will be a ridge or seam wherever it is torn that will show badly if your new paper has a light ground; if it is dark and the pattern is in arabesque, it matters little, as it will not show.

Having cleaned or removed the old paper, take a roll of the new that you desire to apply and hold it up to the wall; arrange it so that the pattern will show evenly at top and bottom, if possible, and then cut off one length. Have ready a table or a board long enough to take the whole piece; then use the first strip cut as a guide, and match all the rest to it. You may cut all the paper up for the straight part of the wall, leaving the intervals over the door and windows to be done at leisure, or with the waste pieces that always accumulate. In cutting the length, be careful to cut the bottoms and tops perfectly square across, and not zigzag, or at hap hazard, for it looks badly to see the pattern mismatched, or a ragged end where it meets the wash board. There are two white edges or selvages on wall paper, one of which must be cut off. Be sure and cut off the right one, or the one that you intend to paper from, and cut all the others at one time. In applying the paper, you will doubtless find that between the doors and windows the pattern will not come out right, leaving a hand's breadth or so to fill up between the frame and the last piece applied. This is of no consequence, as it can be easily filled up by a piece specially cut for it. Be careful and see that you do not reverse the paper or get it upside down in hanging. You can easily tell the right side up if the pattern is in vines, leaves, or geometrical shapes, by noticing which side the shading of the figures is on.

Having cut all the paper ready to apply, roll it up and lay each piece on one side, or lay them all in a pile. Have ready a smooth boiled paste of wheat flour (sound flour, not sour), a whitewash brush, and a board, or table, long enough to take the whole sheet in one length. Make the paste quite thin, not thicker than molasses and as smooth as a custard. Have a chair, step ladder, or table ready, on which you can stand and reach to the top of the wall. Then take your first piece of paper, lay it on the table and apply the paste; not too thickly, being particular to touch the edges and top and bottom well. Then take the sheet by the top, raise it off of the table and support it with one arm (on the right or dry side, of course), and put it up to the wall. Keep it entirely clear of the wall until you fasten the head of the sheet, but previous to this, run your eye down the side and see if it hangs square with the door frame. If it does, have a clean towel or cloth ready, and move it *horizontally* in wavy strokes over the sheet until the bottom is reached, but do not in any case rub up and down or draw the paper in folds; if you do, there will be ridges and wrinkles in it, which destroy the appearance and can never be got out. Hang the sheet properly at first and then follow it down from the top, rubbing across it; and there will not be a wrinkle in it. Apply the second sheet in the same way, and be careful that you match the figures properly. Success depends on this, for nothing looks worse than to see the continuity broken off or a white seam showing between the pattern, up and down the wall where the sheets do not meet. When the corner is reached, if the sheet does not come evenly to the opposite wall, it is better to cut it lengthwise and paste it on; then take the fellow to the piece and apply it also, matching the figures of course. If you endeavor to make the sheet reach round, you will make a bad job of it. Always clean well the table where you paste, so that no paste will get on the pattern; if it does, the colors will run or smudge, and soil the sheet. Gilt papers with delicate lavender grounds require great care in this respect, as the least spot shows badly. This is all there is to be observed in hanging paper, and there is nothing that any one cannot do with a little practice.

Some care or discretion must be taken in selecting papers for the purposes or places they are intended to be put in. Rectangular or geometrical patterns do not look well in a bed room or a sitting room, as they impart a severe and formal appearance that is especially wearisome after a few weeks. Neither is a paper with dark stripes at frequent intervals desirable; the stripes give the effect of battens nailed over boards or rough carpenter's work, and divide a room off with hard lines that tire the eye whenever it rests upon them. All paper ought to impart a clean, cheerful aspect to a room, adding to the homelike appearance and bearing evidence of the taste of the occupants. Never put bordering on the bottom of the wall, as it takes from the hight and makes a boundary for the eye to rest upon where none is desirable. Dark grounds in papers render rooms not fully lighted darker still, and give a somber effect which is very depressing; while open chambers with white hangings have a cold and chilly aspect which it is equally desirable to avoid. No rules can be given for selecting papers; what seems desirable in one case or to one person is objectionable to others, and every one will of course suit themselves in this respect.

EDWIN MARCUS CHAFFEE.

Edwin Marcus Chaffee, a well known and prominent manufacturer of india rubber goods, died recently at Bristol, R. I., in the 65th year of his age. Mr. Chaffee was contemporary with Goodyear, Hayward and Day, and like them was also an inventor, having devised, in 1836, the devices known in the rubber business as the "Machine Patent." He began his career in 1830 and was one of the organizers of the Roxbury Rubber Company; during the past five years, he has been connected as director and secretary with the Providence and National Rubber Company.

Mr. Chaffee did not meet with the pecuniary success to which his inventions and industry entitled him, but, far from being discouraged at misfortune, he persevered in experimenting upon and perfecting new machinery up to within two weeks of his demise. He was one of the sufferers of the poisoning affair at the National Hotel in Washington some years ago, a circumstance which rendered him an invalid and eventually proved the direct cause of his death.

PROFESSOR JOHN W. FRAZER.

We much regret to announce the death, suddenly, on the 12th of October, of Professor John W. Frazer, one of the editors of the *Franklin Journal*, and Professor, for more than thirty years past, of Natural History and Chemistry in the University of Philadelphia, Pa. He was 63 years of age. Professor Frazer was a man of extensive learning and varied attainments.

WILLIAM PRESCOTT SMITH.

Mr. William Prescott Smith, Master of Transportation on the Baltimore and Ohio railroad, died on the 13th of October last. Mr. Smith was closely identified with the railway interests of the country, and more especially with those of the road of which he was the actual manager at the time of his death.

SCIENTIFIC AND PRACTICAL INFORMATION.

BALL LIGHTNING.

An esteemed correspondent, J. R. A., of R. I., was surprised at the letter of J. H. P., published on page 148 of our current volume, and states that in 1859 in the Shetucket valley, Conn., he had a view of a stroke of this kind of lightning at about eight rods distance. It struck a tree, rent it from top to bottom, passed off to a cart tongue laying near, into and through a pile of railroad ties, and into the railroad track about two rods distance. It was seen by six other persons, and the size, as it appeared to all, seemed to be as large as a bushel basket. They were in a building on a rise of ground facing the tree, and had a most perfect view of it. Undoubtedly there are a good many in the United States who have seen such strokes, if they would take the trouble to answer.

THE SUN AND THE ORIGIN OF STORMS.

Mr. John Hepburn says: "I have seen that all gusts coming up in the morning come from the eastward, all about noon from the southward, and all after sunset from the westward; thus clearly proving, to my mind, that the rays of the sun drive the storm, as it were, away from him after their electricity has fired and lit it up. Let the interested please observe, and they will find it so, I believe, in all cases.'

NEW GALVANIC PILE.

A new galvanic pile, invented by M. Morin, is intended to avoid the inconvenience caused by the deposit of copper upon the surface of the zinc, or upon the porous cup. The pile consists of a cylinder of copper surrounded by a concentric cylinder of zinc, between which two cylinders is a third cylinder of filtering paper. There is difference enough in the size of these cylinders to leave concentric annular spaces between the paper and the copper and the paper and the zinc. The former space is filled with sand, and the latter with a stratum of flowers of sulphur. The whole is immersed in sulphate of copper.

Such a pile, it is said, has operated during five months with so little variation that the inventor believes it would work equally well for an additional five. During these five months, the current has been continuous without the need of once touching the battery.

A SIMPLE HYGROMETER.

A new hygrometer has been invented by M. G. Smiths, of Paris, France, in which a salt of cobalt is the essential ingredient. A solution is made of the salt of cobalt, common salt, and gum arabic; into this, strips of paper are dipped and allowed to dry. They will take on a blue color in a dry atmosphere, and become rose colored if the atmosphere be humid.

FORMATION OF CERTAIN METALLIC SULPHIDES.

Privoznick finds that copper, in contact with sulphuretted sulphide of ammonium is transformed into a blue bisulphide and a protosulphide. This is a means for obtaining the sulphides of ammonium, potassium and sodium in a colorless state. Silver becomes covered with a gray crystalline crust of sulphide of silver. Tin and nickel dissolve in appreciable quantities in the polysulphides of ammonium. Iron is covered with a black deposit. The solutions of hyposulphite of soda transform also, slowly, copper and silver into sulphides, with the formation of sulphite of soda.

CONCENTRATING SULPHURIC ACID TO 66° BAUMÉ.

M. de Heuiptume proposes to use a lead-lined vacuum pan for this purpose. The lead is not sensibly attacked by the acid unless the temperature is 200° or over, while in air the sulphuric acid will not boil except at 325°; in the partial vacuum of the pan, 3 to 4 centimeters of mercury, it will readily boil at 190°. The lead, however, softens at this temerature, and is subjected to a considerable pressure from without; and to avoid this difficulty, it is proposed to place in the pan sandstone balls, etc., which are not attacked by the acid.

CRYSTALLINE PHOSPHIDE OF IRON.

J. Sidot reports the following result: Phosphorus vapor was passed over metallic iron in the ordinary method of making phosphide of iron. The product was then calcined in an ordinary crucible with the intention of volatilizing the excess of phosphorus. On breaking the fused mass when cool, the

interior was covered with beautiful crystals, nearly a centimeter in length. These crystals were right prisms with a square base, iridescent upon the surface, strongly magnetic, and were nearly as hard as steel. The formula $Fe_3 P$ very accurately corresponds with the analysis of this phosphide.

SOLUBILITY OF OXIDES IN ALKALIES.

M. Prud' Homme has published the fact that some oxides which are insoluble, or but slightly soluble, in an alkali may be rendered soluble by the addition of an oxide which dissolves in that alkali. Thus chromic oxide dissolves in ammonia when a salt of copper is added, and cupric oxide dissolves in potash if a salt of chromium be present.

MORPHINE IN THE DEVELOPER.

J. Kruger, in *Licht*, suggests the addition of morphine to the ordinary sulphate of iron developer, for photographic negatives, in the proportion of 8 grains of morphine and ½ an ounce of glacial acetic acid to 2 ounces of distilled water. One part of this liquid is to be added to eight parts of the iron developer. The latter is composed of 16 ozs. of water, 1 oz. of sulphate of iron, ½ oz. of alcohol. The author asserts that the use of the morphine as above yields clean, brilliant, and soft negatives, and he desires that practical photographers will satisfy themselves of the correctness of his statement by actual trial.

TUNGSTEN IN STEEL.

Professor Herren has found 8·3 per cent tungsten and 1·73 manganese in Mushet's steel. This steel becomes soft when heated and suddenly cooled, and hard when cooled slowly, just the reverse of ordinary steel.

A CHLOROFORM MASK.

M. Demarquay states that the action of both chloroform and morphine is to lower the animal temperature, and that a combination of the two causes a decrease of 2½° C. It is asserted that the use of both agents combined as an anæsthetic is extremely dangerous. During an operation performed upon a patient under the double influence, it was remarked that the circulation became interrupted, the arterial blood turned black, and repeated fainting fits took place. In order to avoid these grave consequences, M. Demarquay considers that chloroform should be used singly, but not administered in the ordinary manner. He proposes, instead of saturating a compress or sponge with the agent, to use a flannel mask, on which the chloroform contained in a graduated bottle is turned drop by drop. The evaporation is continuous, and the patient breathes without effort. A year's experience with this apparatus proves that by its use all struggling during the period of excitement is obviated, and that insensibility is easily and gradually attained.

PHOTOGRAPHING AN AQUARIUM.

In photographing the interior of an aquarium, the water must be illuminated by strongly reflected solar rays, which may be either transmitted or directly projected. To cause a transmission of the light into the water, recourse must be had to a heliotrope mirror, placed behind the rear face of the aquarium. In front of the latter, the camera is situated, the intermediate space between its lens and the aquarium being surrounded by a pasteboard screen, so that no light is admitted to the instrument, except that directly passing through the object. By this means opaque bodies, such as shells, plants, etc., are naturally lighted by the diffusion of the rays in the liquid, which gives them the photogenic qualities necessary for their reproduction. The second mode of proceeding consists in directing the solar rays at a convenient angle on the forward face of the aquarium, on the bottom of which a mirror is placed, so that all objects contained are brightly illuminated. The water, of course, must be perfectly limpid.

WATER FREEZING AT BELOW 32° FAH.

It is generally admitted that water congeals at 0° Centigrade or 32° Fahrenheit, and that it is only in perfectly tranquil places that it can be kept liquid even at a certain number of degrees below the freezing point. *Les Mondes* mentions in this connection a curious fact, which it considers due to a supersaturation, so to speak, of the water. If in water, at a temperature of —3° C. (about 27° Fah.), which may even be slightly agitated without congealing, the least particle of hoar frost or ice be introduced, crystals of ice instantly form and expand through the mass, producing remarkable and beautiful effects. The eye can watch the formation of the needles of ice, see them group together and obey those mysterious affinities which produce the exquisite forms with which we are all familiar.

TO CASE HARDEN WROUGHT IRON—To case-harden wrought iron, take prussiate of potash, finely pulverized, and roll the article to be hardened in it, if its shape admits; if not, sprinkle the powder on it freely, while the iron is hot. This is applicable to iron axletrees, by heating the axle red with heat, and rolling it in the powder spread out for that purpose, turning it up quickly and pouring cold water upon it, then dip it in cold water as quickly as possible. The axle can be used for years without showing wear.

To protect delicate drawings in pencil or chalk, such as are easily smudged if roughly handled, and to give them more permanence and solidity, it is well to coat them with ordinary collodion, sold by all dealers in photographic materials. The same may, if desired, be used with an admixture of paraffin stearine or castor oil, and affords then an excellent coating. Pencil sketches are in this way rendered clearer, and may therefore, be copied the more easily when so treated.

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Notes & Queries.

We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—TURNING WIRE ROLLS.—What is a good plan for turning or cutting taper wire rolls?—C. E. A.

2.—SILICATE OF SODA.—Is water glass again soluble in water or oil after once becoming hard?—W. K. L.

3.—TINNING PINS.—How are pins and other small brass articles tinned?—G. W.

4.—VARNISH FOR BOILER HEADS.—What is a good varnish for a locomotive boiler head?—C. G. S.

5.—AN ELECTRIC VACUUM.—Has science ever determined what substance, species, or condition of matter constitutes a vacuum or void in electricity?—D.

6.—PURIFYING BICHROMATE OF POTASH.—How can commercial bichromate of potash be rendered chemically pure?—G. B. M.

7.—PURIFYING ZINC.—How can commercial zinc be made chemically pure? The zinc is to be used in the hydrogen test for arsenic and antimony.—G. B. M.

8.—LIGHT FOR MAGIC LANTERN.—How can I make a light suitable for a medium sized magic lantern? Gas or oil makes too much smoke.—A. B.

9.—OIL PROOF WOOD.—What cheap and harmless substance can I use on small wooden boxes to make them hold oily substances without the grease soaking into or through the wood?—W. K. L.

10.—HARDENING WOOD.—Can anything be applied to wood to render it hard enough for a cylinder or roller for a printing press? Can wood be used for such a purpose, and is it already so used? If so, what is the kind of wood?—S.

11.—BREAKING STRAIN ON IRON RODS.—What weight will break an iron rod, of ⅝ inch diameter and 40 feet length? The rod is to be fastened rigidly at the ends, and the weight suspended in the middle.—D. R. R.

12.—REMOVING INK STAINS.—Is there any chemical that will remove ink from paper without discoloring the paper?—W. W. W.

13.—CEMENT TO RESIST THE ACTION OF BRINE.—Is there any cement or pitch that will do to line a vat to hold brine, the temperature of which will range from 25° to 110° Fah.?—P. Q.

14.—FREAK OF BOILER.—A boiler has something that jars or thumps inside it, as I can feel by placing my hand on some of the pipes. There is some scale at that end where I hear it; the last sheet, a little from the bottom, is from 1-16 to 2-16 of an inch thick. Is that the trouble? If so, how shall I remove it?—C. H. C.

15.—COMBUSTIBLE PAPER FOR CARTRIDGES.—How is the paper for sporting and other cartridges made? What combustible solution is used to cause the paper to ignite from the percussion cap?—B. F. R.

16.—A RUBEFACIENT WANTED.—Last year a sickness left upon my face a mark more original than agreeable. My right cheek is as red as a cherry, while the left remains with its usual color. As it is impossible to remove the red mark, I should like to know if there is any way in which I can render my left cheek as red as the right.—A. T.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

C. M. K. asks, what space will the oxygen and hydrogen, evolved by the decomposition of a cubic inch of water, respectively fill? Answer: The oxygen will fill a space equal to 800 cubic inches, and the hydrogen, 1,600 cubic inches.

PROPELLER.—Cannot a propelling wheel be made from a flat circle of iron or steel, cut into segments which are left attached at the center, the segments being twisted obliquely to the axis?—A. T. of Pa. Answer: Yes. But the plan is not new.

THE WORLD'S ANTIQUITY.—What does Professor Thurston mean by saying, on page 212 of your current volume, that "a hundred thousand years this wonderful water power has been uninterruptedly in existence"? Does he intend it as a statement of fact, or is it a hyperbolic figure of speech? The Hebrew text of the Scriptures states that the creation took place 4,004 years before the Christian era, and the Septuagint, 5,872 years.—H. E. G., of N. H. Answer: It is now a common belief, among men of science as well as among some theologians, that the periods or stages of the creation, described by Moses as seven days, cannot possibly be seven of our days of twenty-four hours each. And if the word "day" is a figurative expression, it may be taken to signify an epoch of any length, and so harmonize with the known facts of the inconceivable antiquity of many of the works of Nature. Professor Thurston no doubt judged the time he mentioned by a personal inspection of the work done by the water on the rocks of Niagara.

FRICTION.—Is it practically a fact that friction decreases as speed increases: that is, would the cross head of a stationary engine wear less if it were run at 600 feet per minute than if it were run at 200 or 300 feet per minute, the engine doing the same amount of work?—W. F. C. S., of Ohio. Answer: It is laid down by all the the modern authorities that friction is proportional to the pressure forcing the surfaces together, but it is independent of the velocity with which one body is drawn across the surface of the other, that is, that it requires the same amount of energy to surmount the friction, or to make a body pass over a given distance of the surface, whatever may be the velocity of its motion. (See Nichol's "Physical Sciences," article "Friction," and Professor Willis, page 238 of our current volume.) It follows from this that the friction or wear of any part of a machine will be proportional to the distance travelled, whether the same be done in a long or short time. The common notion that the friction diminishes as the speed increases has been attributed to experience in cases where the pressure is so slight as to allow of some occasional separation of the surfaces when the velocity is high.

CENTRIFUGAL FORCE.—What is the law governing centrifugal force? Having the weight and velocity of a body, and the diameter of the circle it describes, how can I determine its outward pressure?—C. H. C. Answer: The centrifugal force varies as the square of the velocity and is in inverse ratio to the distance of the body from the center of the circle; but if the figure described be an ellipse or other non-circular curve, the calculation must be made as for a circle which is tangential to the point at which the moving body is. The following is a formula: Multiply the square of the number of revolutions per minute by the diameter of the circle in feet, and divide the product by the constant 5870; the quotient is the centrifugal force in pounds when the weight of the body is 1 lb. Thus a body, revolving in a circle of 4 feet diameter at the rate of 100

revolutions per minute, will give 100x100x4=40,000, which, divided by 1870=6·2413 force for every pound of its weight. If the body weighs 100 lbs., the centrifugal force, or the tension on the string which holds the body, will be 624·13 lbs.

W. S. P., of Ky., sends a mineral specimen, asking what it is. Answer: The specimen is iron pyrites (bisulphuret of iron). It crystallizes in cubes, often, however, greatly modified, as in this case. When abundant, it is a source of sulphur and of copperas.

S. C. H. says:—I send you a small specimen of mineral. Will you tell me what this rock contains, and what is its name? Answer: The mineral is iron pyrites in a calcareous rock.

G. B. L., writing from Bridgeport, Conn., says:—Enclosed I send you a stereoscopic view of a fungus found, a few days since, growing upon an old anvil block in an unused blacksmith shop. It was of a pure white color, and about nine inches in extreme length, seven wide, and five high. The finder, considering it a thing of beauty and of a perishable nature, concluded to have a photograph made of it, and knowing that you took an interest in the beautiful works of Nature, I thought I would send you a copy. It had more the appearance of a piece of marble sculpture than of vegetable origin, and was much admired by all who saw it; and parties here have endeavored to preserve it in alcohol or naphtha, but it has lost its beautiful white color and turned yellowish or faded. I have seen many fungus growths upon wood, but never saw anything as beautiful in form as the enclosed copy. Answer: The photograph is excellent, and we are much obliged therefor. It represents the *Hydnum coralloides*, one of the most beautiful of hymenomycetous fungi. For the preservation of fungi, the following mixture has been recommended:—Sulphuric acid, two pints, water, 8 pints; mix and add creosote, 1 pint. Bottle the fungi in this and cork tightly. It is said to preserve them perfectly, without change of color. Fungi may be preserved by drying by bedding them in silver sand, gills upward, in tin boxes, and placing them in a slow oven for two or three hours.

DEW POINT.—What is the formula for calculating the dew point from the data of the hygrometer?—C. A. De S. Answer: To calculate correctly, a condensation hygrometer must be used; the hygroscope (wrongly called hygrometer), of De Saussure, and similar instruments do not indicate the quantity of moisture. The dew point is the number of degrees by which the temperature must be lowered to induce a deposit of the atmospheric moisture. Daniell's and Regnault's instruments are specially constructed for this purpose; and there is a third, invented by Professor Connell, of Scotland, which also shows the dew point.

A. B. McC., of Mich., asks whether he can make steam easier with water in his boiler up above the third gage cock than with "steam and water" at the lower cock. Answer: We presume that he is using one of the ordinary forms of boiler, and, if that is the case, he will probably keep steam easier, but with less safety, with the lesser quantity of water, as he will be likely to work drier steam. With a boiler which superheats its steam, there might be a possibility that three gages of water would cause the more rapid generation of steam and greater efficiency. The result would also depend somewhat upon the way in which the boilers are set. We should not advise him to secure economy by the sacrifice of security. Our correspondent also has trouble with his draft when the wind blows from the eastward. This may be caused by neighboring buildings, trees or elevated land, or it may be that an east wind in that locality is usually damp and accompanied by a fall of the barometric column. We have no means of judging which. Increased light of chimney will probably remedy this evil, whatever its cause.

EXTRACTION OF SILVER.—To J. H. P., query 1, page 217.—Mix your refuse with an equal quantity of wood charcoal, place in a crucible and submit to a bright red heat. A silver button will be found at the bottom.—E. H. H., of Mass.

BLEACHING SHELLAC.—To L. Q. B., query 2, page 217.—Purchase bleached shellac at an apothecary's or paint shop. Small quantities are troublesome for an amateur to bleach.—E. H. H., of Mass.

DISSOLVING SHELLAC.—L. Q. B., query 3, page 217.—Shellac may be dissolved in either a strong solution of borax, or a solution of ammonia.—E. H. H., of Mass.

DISSOLVING GLASS.—To D. R., query 14, page 217.—Dissolve glass in a concentrated solution of caustic soda by submitting it to a pressure of from 30 to 50 pounds per inch. When used, it may retain a certain amount of gloss, but will be acted on by a damp atmosphere or water.—E. H. H., of Mass.

CEMENTING WOOD TO GLASS.—To W. R., Jr., query 3, page 234.—Cement your wood first with two or three coats of isinglass in acetic acid, then the surface of the glass; press the two together, and allow to dry.—E. H. H., of Mass.

ELECTRIC LIGHT.—To F. D., query 5, page 234.—Use 6 half pint cells of Bunsen's battery, and attach carbon electrodes to the terminals of your wires; approximate the electrodes, and you will have a fine beam of light.—E. H. H., of Mass.

MOTHS IN FURS OR WOOLENS.—Persons do not need cedar or camphor to keep out moths. Let them sew their furs or other articles up in linen when they put them away, and moths will not trouble them. I have done this every spring and have never yet been troubled with moths.—T. E. L.

ELECTRO-MAGNETISM.—N. B. D. says: I am constructing an electro-magnet, and wish to know whether my magnets will have greater attractive power if the cores be made long and small, or short and thick? Answer: An electro-magnet having short and thick poles will have a greater attractive force than a magnet with long and slender poles, other conditions being equal.—What would be about the right diameter for cores three inches long? Answer: It depends on the intended use. A diameter of three quarters of an inch may suit you.—Would the portable battery, described by Professor Rains in No. 13 of your current volume, generate sufficient electricity to make a very powerful magnet? Answer: We have not tried this battery.

Communications Received.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Temperature of the Moon.—By J. H. R.
On the Kinds of Lightning.—By W. A. A.
On the Rotation of the Earth.—By H. B.
On Science and Theology.—By J. F.
On the Philosophy of Light.—By E. S. G.
On the True Solution of the Least Square, with Sundry Chemical, Optical and Meteorological Suggestions.—By J. K.
On A New Theory of Electricity and its Influence on Planetary Motion, Aurora, Needle, Meteorites, Comets, etc.—By H. H. P.
On Car Coupling Dangers.—By C. E. D.
Perpetual Motion Made Possible.—By R. C.
On A New Geometrical Problem.—By J. S. E.
On the Transmission of Motion.—By J. W.
On A New Method of Propelling Canal Boats.—By C. B. M.
On the Cold Water Engine.—By E. L.
On the Rotation of the Earth.—By A. W. L.
On Mr. Coleman Sellers' Illustrations of Plate Coupling.—By J. G.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CHURN.—William P. Messick and Harvey T. Messick, Clarksville, Texas.—This invention relates to a new churn mechanism whose parts can be easily taken apart or put together, and which operate in conjunction to rapidly reduce the milk to butter. The invention consists in constructing the dasher in two parts, which rotate in opposite directions, and in supplying to their shafts upper detachable ends hung in a slide to be conveniently thrown into and out of gear.

SPRING MOTIVE POWER.—John B. Howell, Wilkesbarre, Pa.—This invention consists of a series of coiled springs and cases or drums therefor, arranged side by side on a shaft and combined together and with the winding up mechanism and transmitting mechanism in such manner as to constitute in effect one spring of great length but in separate coils, which gives much better results in practice than a single spring, of the same length in a single coil, for driving light machinery.

BAG TIE.—John Bowers, Brookville, Ill.—This invention consists of a small rectangular piece of thick leather, or any equivalent stiff flexible substance, with an eyelet near one end and a slit, which is fastened to the bag by one end of a cord long enough to wind several times around the sack and around the coils of itself, between the leather and the sack, and then introduced to the eyelet through the slit, where it is held fast by the knot in the end.

ICE CREAM FREEZER.—Edwin Halloway, Belvidere, Ill.—This invention relates to the class of freezers wherein the revolving cream holder has a rotary stirrer or dasher within it, and is arranged in an ice holder placed in a wooden tub. The ice holder has small holes in the bottom near the center, to allow a draft of cold air contained in the tub to circulate up through the ice, which greatly facilitates the freezing.

SASH HOLDER.—Henry W. Stephenson, Jr., Cincinnati, Ohio.—This invention has for its object to furnish an improved sash lock, locking the sash into any position into which it may be raised; and it consists in the construction and combination of a weighted lever, the middle part of the outer end of which is cut away, and the arms thus formed are bent to one side at right angles, thus forming a space in the forward end of the lever through which a ball or block, made of rubber or other suitable material, may protrude to come in contact with the side of the casing or frame. To the lever is attached an inclined plate which takes hold upon the ball or block. The inner end of the lever is weighted so as, when left free, to always hold the ball or block in contact with the face of the casing. By this construction, when the sash is released after being raised, the friction of the ball or block against the casing will force the said ball or block upward into the narrower part of the space between the said casing and the inclined plate, securely holding the sash. When it is desired to lower the sash the inner or weighted end of the lever may be raised, lowering its outer end and withdrawing the ball or block from the casing. A bolt locks the sash in place.

COMPOUND FOR DESTROYING WORMS AND INSECTS ON TREES, ETC.—Zeno Fen de Moss, Pleasanton, Kansas.—The object of this invention is to furnish a compound to prevent the depredations of the worms and insects which prey upon fruit and other trees, especially the worm known as the "borer," and it consists in strong lye from potash, soft soap, petroleum, and kerosene.

HAY AND STRAW STACKING APPARATUS.—Daniel W. Baird, Lebanon, Tenn.—This invention relates to a new apparatus for elevating and depositing at a suitable place hay, straw, or other material; and consists in a new windlass mechanism for swinging the hoisting beam on its pivot, which is done by means of a sliding carriage on the upright, and by a brace extending therefrom to the beam.

STREET GUTTER.—Hugh O. Ames, New Orleans, La.—This invention consists in the construction of curbs and gutters for streets of cement in molds of the form required, the said cement being rammed hard in the molds, which may either be constructed of boards or plank in two parts, representing the upper and lower sides of the gutter and curb, or the earth bed of the street may constitute the lower side of the mold, while the upper side will be formed of a half mold of planks. The curb and gutter will be formed together in one structure, or each may be formed separately. When the curb is high, buttresses of metal or stone may be arranged behind in the earthbed for strengthening it, and the gutter and curb or either may be strengthened by one or more metal rods incorporated with the cement when being packed in the mold.

GRIPING BLOCK FOR PRESSES.—George W. Swinebroad, Bolivar, Tenn.—This invention consists of steel bars, combined with the inner walls of the griping blocks in presses and other machines, for griping hold of straight bars passing through them by tilting on said bars, so as to gripe and hold for working said bars short stages at a time by levers, the said steel bars being used in the parts most subject to wear to resist the same, and because of the superior capacity of steel to gripe the bars and retain its hold; also, because they can be removed when worn out and new pieces put in.

BOOT AND SHOE CLEANER.—John Malarkey, New York city.—This invention has for its object to furnish a simple and convenient device for cleaning boots and shoes from dust, mud, etc., and it consists in a scraper for removing mud or dirt, and also a kind of box formed with bottom, sides, and top. These portions are covered with bristles, and are so arranged as to clean various parts of the shoe at once.

SMOKE CONDUCTOR FOR LOCOMOTIVES.—Alfred Storm, Matteawan, N. Y.—This invention has for its object to furnish an improved device for conducting the smoke to and discharging it at the rear end of the train, and self adjusting to the various positions that the cars may take with respect to each other in passing around curves, etc. In the rear side of the smoke stack of the locomotive is secured the end of a pipe, the other end of which terminates at the rear end of the locomotive. To the top of each car of the train is attached a similar pipe. The pipes are all stationary, and their ends are all at the same level, so as to coincide with each other when the cars are run together. Upon the ends of the pipes are fitted sleeves which are held outward by coiled or equivalent springs placed upon guide pins, which pass through lugs attached to said pipes and sleeves, and against which lugs the ends of the said springs rest. The outer ends of the sleeves are made bell shaped and are flanged, which ends abut against each other, and are held in contact as the cars play upon their couplings by the springs. A flanged ring cap receives the adjacent ends of the sleeves to cover the openings formed between them when the train passes around a curve, and thus prevent the escape of smoke through said openings.

CLOTH RACK.—Alexander W. Voegtly, Hannibal, Ohio.—This invention relates to a new rack, for use in stores or warehouses, for the support of rolls or pieces of cloth for display. The invention consists in the use of a standing frame, having horizontal arms, which form the supports for the cloth. The inconvenience which is now experienced by merchants in taking goods from the lower parts of large piles is overcome by this invention, as any piece of goods can be taken off any part of the stand without disturbing the balance, and is easily replaced. The frame may, if desired, be made high enough to stand on the floor, and provided with casters so it may be rolled from one place to another.

PLOW.—Willis H. Smiley, of Bentonville, Ark.—This invention has for its object to furnish an improved subsoil plow, which may be attached to any ordinary plow, whether used for preparing land to receive the seed, or for cultivating crops, and which shall be so constructed that it may be readily adjusted to work deeper or shallower in the ground, as may be required; and it consists in the subsoil plow, made with a point at each end, so that when one point becomes dull the plow may be detached and reversed, so that the plow need be sent to the shop to be sharpened only one half as often as a single point plow. It is adapted to be attached between the handles and alongside the beam of an ordinary turn plow.

BEE HIVE.—George F. Hixson, of Gallipolis, O.—This invention comprises a peculiar construction and arrangement of the strips composing two of the sides of the hive with a view to facilitating opening of the case to examine the condition of the bees and comb, and to obviating the necessity for the use of other or separate means for preserving the proper spaces between the comb frames. It also consists of a peculiar construction of the hive to adapt it for utilizing the animal heat of the bees for warming the honey boxes.

WASHING MACHINE.—John H. Doyle, of Williamsburg, O.—This invention has for its object to furnish an improved washing machine, and it consists in a rectangular box supported upon legs or an ordinary round wash tub, as may be desired. Two parallel bars are pivoted at one end to the sides of the tub to keep them from sliding about. Rollers, any desired number of which may be used, revolve in holes in the inner sides of the bars. The bars and rollers form the bed upon which the clothes are rubbed. The rubbing board, the lower surface of which is so arranged as to enable the operator to apply any desired pressure to the clothes while rubbing them, or to conveniently raise the rubber from the clothes when desired.

EGG BEATER.—William O. Crocker, of Laconia, N. H.—This invention has for its object to furnish an improved device for beating eggs, butter, etc., churning small quantities of cream, and for other similar purposes, and it consists in an outer beater formed of sheet metal, and having its sides flared in opposite directions, in combination with the inner beater, the same being connected with mechanism, so as to be driven in reverse directions; also the combination, with the beater, of a downwardly extended arm, provided with a notch, as specified, whereby said beater may be supported on the edge of the dish containing the material to be operated on.

GRATE BAR.—Philip Umholtz and Augustus Umholtz, of Tremont, Pa.—This invention has for its object to furnish an improved grate bar, so constructed that its parts may expand freely in all directions without breaking or straining said parts, and without interfering with each other.

SAW MILL.—Morgan A. McAfee, of Talbotton, Ga.—This invention consists of the application to saw mills of a "liner," by which to gage the stuff to be sawn in adjusting it on the blocks in advance of the saw, and show to the operator when the stuff is in the right position to have the desired amount slabbed or edged off, the said liner being a line or cord stretched, in advance of the saw in its plane, on levers or other devices, by which it can be readily let down close to the stuff to be gaged by it or raised up out of the way.

BEE HIVE.—Frederick Grabbe, of North Topeka, Kan.—This invention relates to a bee hive so constructed that the fixed support for the same forms two of its sides, while the other sides are made removable to permit easy access to the interior, the hive being set in an inclined position.

BASIN COCK.—Alfred Crossley, of Philadelphia, Penn.—In this invention a T headed valve piece on the lower end of the nozzle pipe, working horizontally in a chamber below the stuffing box, and closing at each end against an eccentric seat, through one of which the water enters from below, has an escape passage leading to the nozzle through the side instead of at one end, acting on the seat, through which the water enters, as heretofore, so that the valve is turned away from the seats to open the passages instead of being closed upon it, and so that the water first enters the space in which the valve turns, and then passes through it to the nozzle, thereby allowing of opening and closing the valve with a shorter movement, and saving in wear upon it.

STOVE PIPE DAMPER.—Robert R. Ball, of West Meriden, Conn.—This invention relates to a new and useful improvement in dampers for stove-pipes and other purposes, and consists in the construction of the rod or spindle of the damper and the parts connected therewith, especially in a tapering washer and screw nut, and in a non-conducting material at the knob end of the spindle. By this arrangement the damper may be adjusted without danger of burning the fingers, and will be held securely in any desired position. The friction is entirely on the edge and not on the sides of the pipe. The pipe is not, therefore, compressed between collars, but produces friction where it will be uniform and readily overcome.

SPRING BED BOTTOM.—William D. Mason, of New York city, and Cornelius H. Jacobus and Robert Millen, of Newark, N. J.—This invention has for its object to furnish an improved spring bed bottom. Two longitudinal bars or stretchers are placed near the side boards of the bedstead. To the ends of the stretchers are secured eyes, to receive the hooks formed upon the ends of the coiled wire springs, the hooks formed upon the other ends of said springs being hooked upon hooks or eyes attached to the end boards of the bedstead, each stretcher being thus entirely independent of the other. Two cross bars are placed in such positions as to properly balance the weight upon the bed, and they are notched to the stretchers to keep them securely in place. Upon the cross bars, at suitable distances apart, are placed elastic longitudinal slats, said slats resting in notches formed to receive them in the cross bars. The slats are kept from getting out of place longitudinally by stop pins.

BEE HIVE.—Don J. Arnold, of Brownville, Neb.—This invention relates to a new construction of bee hive, whereby the frames are secured in their appropriate places when the hive is shut, but liberated to be easily removed when the hive is open, and whereby the surplus honey boxes are held confined to the lid when the same is opened, and are not necessarily exposed. The invention consists, first, in applying wedges or inclined blocks to the lid or the hive for holding the frames together while the lid is closed. The invention also consists in such a combination of the upper hood or cover with the lid of the homestead and with the surplus honey boxes that the latter will be confined in the hood, which they fit exactly while the lid is opened.

MOTOR.—Charles J. Schumacher, of Portland, Maine.—This invention relates to an apparatus for storing up power for driving sewing machines and other light machinery. It consists in a series of spiral springs arranged on stationary spindles and revolved by means of gearing and crank, ingeniously constructed and arranged to accomplish the desired object.

MACHINE FOR MAKING BOXES FOR ELEVATORS.—William L. Young, of Marthasville, Mo.—This invention consists of certain arrangements of apparatus in one machine, whereby the workman can perform all the special operations required to make conveyer-flights by power machinery, and govern each particular operation by a standard gage, so that the flight will be much more uniform in respect of the dimensions and finished better than when done by hand, besides being made very much cheaper.

GUN LOCKS.—John J. Byers, of Delta, N. Y.—The invention consists in the relative arrangement of the hammer and the trigger with their respective springs so as to lessen the aggregate space required for them and improve the outside form of fire arm without sacrificing convenience of location in the stock. The stock is recessed, to receive the hammer and trigger, a projecting lip being above the hammer for guarding it. The stock has a perforation through it, whereby the trigger can be reached. The lower part of the stock, under the perforation, is arched like an ordinary trigger guard, but made hollow to receive the hammer spring. When the hammer is drawn back, a tooth of the trigger snaps into a notch on the hammer and holds the hammer cocked. This invention will be found fully illustrated and described on page 282 of the present volume of the SCIENTIFIC AMERICAN.

PLOW.—Francis P. Brannan, of Richmond, Va.—This invention has for its object to furnish an improved plow. The body of the plow is cast solid with the standard or bolted to said standard. The throat of the plow is formed by curving the standard back from the colter of the plow, so that rubbish from the furrow slice or land cannot collect in the throat, and thus clog or choke the plow. In the case of a cast beam, the rear end of the said beam and the forward end of the standard are made with circular offsets to fit upon each other, and through the centers of which passes the bolt by which the said standard and beam are secured to each other. The beam and standard are further secured to each other by a second bolt, upon which is placed a polygonal washer, the flat faces of which rest upon the straight flange formed upon the standard for that purpose, so that by adjusting a face of the eccentric nearer to or further from the bolt to rest upon the flange, and tightening the nuts of the bolts, the plow will be adjusted to work deeper or shallower in the ground as may be desired.

WASHING MACHINE.—John Barnes, of Spartanburg, Ind., assignor to himself and J. W. Locke, of same place.—This invention has for its object to furnish an improved washing machine. The working chamber of the machine is made into a circular form by bars or rounds, placed in the

corners and arranged in a curve across one end of the machine, thus forming, also, a chamber into which the water may flow. To the bottom of the box are attached radial ribs, over which the clothes are rubbed to be washed. A wheel, a little less in diameter than the washing chamber, is arranged, to the lower side of which are attached a number of downwardly projecting pins, which take hold of the clothes and carry them over the ribbed bottom of the box. The said wheel moves up and down upon the said shaft to adjust itself to the thickness of clothes being operated upon, and is revolved first in one direction and then in the other, sweeping the clothes through the box and rubbing them upon the ribbed bottom of the said box, the clothes being held down upon said bottom by the weight of the said wheel.

FENCE POST.—Frank Miller, of Warsaw, N. Y.—This invention relates to the use of gas pipe for the lower part and wood for the upper part of a fence post, with the object of economizing wood and avoiding its rapid decay in the ground.

GARBAGE BOX.—Theodore Jarvis, of New York city.—This invention has for its object to furnish an improved garbage receptacle, being so constructed that the garbage can be readily shoveled from it into the cart without being scattered over the sidewalk.

WASH BOILER.—George Sinniger and Sheridan S. Sabine, Chatham, Ill.—This invention has for its object to furnish an improved clothes washer, in using which, the heat applied to the bottom of the boiler forces the hot water up through a pipe into a head piece through the holes in which it is discharged upon the clothes in the boiler. The upward flow of water from the central chamber tends to form a vacuum in the end chambers, so that the descent of the water through the clothes into said end chambers is assisted by atmospheric pressure.

COFFEE ROASTER.—Job Brown, Southampton, Ill.—This invention relates to a new coffee roaster or corn popper that is provided with a corrugated bottom and supported on rockers, and intended for use in the oven of a stove or range, in which it can be moved back and forth and rocked to turn the grains to prevent burning.

FEED REGULATOR FOR MIDDLINGS SEPARATORS.—Alfred G. Mowbray, Stockton, Minn.—This invention relates to an improved apparatus for separating middlings from bran. The weight of the material in the hopper serves to hold the side open sufficiently to allow the escape of the middlings, and, when no more remains in the hopper, a bar will close the side.

PRESS.—Allen Lasswell, Springfield, Texas.—The object of this invention is to furnish a cheap, durable, and effective press for pressing cotton, hay, and other articles; and it consists in a double lever arranged in combination with fulcrum plates and a frame and follower, and with or without a wheel and axle. To press a bale of cotton or other commodity, the lever is started at one of the upper fulcrum holes, and travels down, and, as the bale is compressed, the fulcrum pin is changed from one side of the center to the other, alternately, until the proper degree of compression has been obtained. The fulcrum is now changed, and the power is applied to the other end of the lever. The wheel and axle at the lower end of the lever, being loose, will revolve as one end is raised, while the other end of the lever is brought down, and the operation is repeated until the bale is pressed.

CAR COUPLING.—Henry Allen and Addison H. Baldwin, Houston, Texas.—This invention has for its object to furnish an improved car coupling, and it consists in the draw bars, connected with the car body in the ordinary manner. The outer ends of the draw bars are slotted longitudinally, and in said ends, upon each side of said slot, are secured blocks of rubber, which may be boxed or banded and let into or bolted to the said ends. The hook, the forward or hooked end of which is beveled, slides over the pin when the cars are run together, with the said hook in a horizontal position. The rear or inner ends of the hooks are curved downward, and are pivoted to and between studs or projections attached to or formed upon the under side of the slotted outer end of the draw bar. Upon the under rear part of the hook is formed a shoulder, which rests against a pin passed horizontally through the forward end of the draw bar, and which is designed to support the hooks in a horizontal position and to sustain the draft strain. The pins also serve for the hook of an adjacent car to hook upon in coupling the cars. A hook is designed to be attached to each draw bar of each car, and when not in use may be turned back to rest in the inner end of the slot in said draw bar; or, by removing the pin, it may be allowed to hang beneath the draw bar so as to be entirely out of the way.

WASHER AND BOILER COMBINED.—John Runkle, Reading, Pa.—This invention has for its object to furnish an improved machine by means of which the clothes may be boiled and washed at the same time, and it consists in a cylindrical vessel supported upon legs of such a length as to raise the vessel to such a hight that a furnace may be placed beneath it. The edge of the projecting top plate of the furnace is secured to the edges of the bottom of the cylinder by convenient means. To the top edges of the vessel is attached a cross bar, to which are attached bearings for a horizontal shaft, to the outer end of which is attached a crank for operating the machine. To the inner end of the shaft is attached gearing, which communicates with the upper end of a vertical shaft which passes down through and revolves in bearings in the center of the cross bar, and its lower end revolves in a step or socket in the center of the bottom of the vessel. The body of the shaft is made square in its general form and with concave sides. There are four rollers, so arranged as to be carried around by and with said shaft in its revolution. A circular plate is made smaller than the interior of the vessel, and to its upper side are attached rounded projections, which act upon the water and clothes to throw them into violent commotion. To the inner surface of the sides of the vessel are attached vertical ribs, which operate, in connection with the projections and rollers, to throw the water and clothes into violent agitation and clean the clothes in a very short time.

PISTON PACKING.—William F. Williams, Schenley, Pa.—The object of this invention is to provide means for making joints steam tight, and to form a substance for making gaskets and for packing pistons and piston rods, which shall be pliable and self lubricating when applied to frictional surfaces; and it consists in a composition for steam packing, consisting of long strips of wood and asbestos saturated in oil and placed in a flexible case.

CLOTH DRYING MACHINE.—Nelson P. Akin, Philmont, N. Y.—This invention consists in subjecting cloth to steam and hot air treatment, or hot air alone, for economizing time in drying it after it is washed, to remove the oil, etc. it contains when it comes from the loom, which is done by means of a perforated hollow cylinder, whereon the goods to be heated are wound. The cylinder is mounted on a stand or support adapted for the application of the steam and hot air by being forced into said hollow cylinder and through the cloth, said cylinder being provided with both a steam pipe connection with a steam generator, and a hot air pipe connection with an air condenser; the object being to suject the cloth first to the steam treatment for vaporizing the water contained in it, and then follow up the steam with air so heated by compression or otherwise that it will rapidly expel the moisture remaining after the steam is shut off, or the steam may be dispensed with and the air alone used.

BEE HIVE.—Harris Scovell and John C. Banker, Waseca, Minn.—There is an idle and vagrant class of bees, as well as of men, who are disposed to prey upon the industry of others, and who plunder the hoarded treasures of the more thrifty occupants of the hive. There is also the destructive "miller," which is constantly seeking an entrance to the hive. Now, the robber bee and the "bee-miller," being strangers to the hive, will light upon the side or front of the hive, and will crawl about to find an entrance. They are accommodated in this matter, by being provided with one or more entrances which lead them astray and into a chamber in the top of the hive, which contains no honey, and where the industrious bees do not go. At the base of one or more hollow columns orifices or entrance holes are made, and at the top of the column is an orifice for egress into a vacant chamber in the top of the hive. In crawling on the front of the hive (or on this attachment to the hive) the robber bee or bee miller will find one of these entrances, by which he will be led to the top of the hive into the vacant chamber before mentioned.

FELTED FABRIC FOR SURGICAL SPLINTS.—John Cocking, London, Eng.—This invention and discovery relate to the preparation of proplastic sheets for surgical splints, composed of wool, or other animal fiber, felted together. The porous sheets are saturated with a proofing solution, composed of gum shellac, frankincense, resin, borax dissolved in water, and methylated spirit, applied cold. The fabric is then dried, after which it is subjected to steam and then exposed to a heat of from 160° to 190° for a space of from twenty-four to thirty-six hours, according to the weight of the fabric. The fabric thus proofed and dried is steeped in a solution of sulphuric acid and water, which destroys the borax and hardens the proof. The sulphuric acid is in its turn destroyed by steeping the fabric in urine and water, and it is then immersed in running water until perfectly cleansed. The fabric is then dried and is fit for use.

WHIFFLETREE.—James L. Darden, Cotton Plant, Miss.—This invention is an improvement over the trace detaching apparatus of John Laughlin, patented October 28, 1864, No. 86,786, and consists in levers which may be raised out of the notches in the tug bars, allowing said tug bars to be withdrawn from the singletree, thus detaching the horse. Thus attached to the rear side of the singletree, the detaching devices are not liable to be injured by contact with any object, and are not noticeably exposed to view, while their efficiency and reliability of action are increased.

ORE CRUSHER.—William P. Hammond, Napa City, Cal., assignor to himself and Henry Mygatt, of same place.—This invention has for its object to furnish an improved device for raising the stamps for crushing rock, working with less friction and requiring less power to operate it than the ordinary devices for such purposes. The shaft passes up through guide holes in the frame so that it may always move up and down vertically. To the driving shaft is attached a cam, which is made slightly spiral so as to slightly rotate the stamp while being raised. A small roller, the face of which is grooved, fits upon the face of the cam and is pivoted to the tappet through which the shaft passes, and which is kept in place upon the said shaft by collars placed upon the said shaft, the one below and the other above the said tappet. The upper collar is adjustably secured to the said shaft so that the stroke of the stamp may be regulated as desired. The tappet is so arranged that the axis of the roller may be directly over the shaft. By this arrangement the cam will lift the stamp vertically, and with the greatest advantage of leverage, so as to require the smallest amount of power. A guide keeps the roller in proper position and thus diminishes friction.

ASH BOX.—George Dunlop, Williamsburg, N. Y.—This invention has for its object to furnish an improved box for ashes, garbage, etc., which will not absorb and afterward give out offensive and unhealthy odors, can be readily cleaned, will be convenient in use, and will prevent the ashes and garbage from being scattered over the sidewalk and street. The bottom ends and sides of the box are formed of flag stones or stone slabs. The box is designed to be set in the sidewalk.

[OFFICIAL.]

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Trap, fly, W. De Puy	131,813
Trap, fly, W. B. Clark	131,848
Tweer, J. H. Gartaide	131,780
Tweer tester, B. A. Fisher	131,866
Umbrella, folding, Walcott and Berry	131,914
Valve for closets, etc., hopper, L. Wolff	131,924
Vegetable slicer and stripper, Sawyer and Goodridge	131,787
Vessels, propulsion of, H. P. Miller	131,770
Washing machine, Kirkpatrick and Bell	131,881
Water elevator, steam, W. Burdon	131,737
Water wheel, turbine, J. J. Faulkner	131,865
Wheel, balance, H. Randall	131,782
Whiffletree stub, W. C. Shipherd	131,792
Whiffletrees, attaching, H. Clough	131,809
Window glass, setting, J. M. McMaster	131,894
Wrench, rotary, A. Pitcher	131,899

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his case to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants or their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

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A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, for full particulars.

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Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

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On the 1st of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish full instruction.

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